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HONEYWELL MODEL 7899
AUTOMATED EMI
MEASUREMENT SYSTEM

Honeywell

TEST INSTRUMENTS DIVISION • ANNAPOLIS, MARYLAND

Preliminary Specification

HONEYWELL MODEL 7899
AUTOMATED EMI
MEASUREMENT SYSTEM

APRIL 1968

HONEYWELL INC.
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ANNAPOLIS OPERATION

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HONEYWELL MODEL 7899

AUTOMATED EMI MEASUREMENT SYSTEM

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HONEYWELL MODEL 7899
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INTRODUCTION

This Specification Proposal is furnished to acquaint the reader with the capabilities and characteristics of the Honeywell Model 7899 Automated EMI Measurement System. The possible applications of this system include:

1. Measurement of interference generated by an electronic or electromechanical unit under test.
2. Surveillance, or detection and measurement of electromagnetic energies present at a given location.
3. Engineering analysis of the spectrum from 3 Hz to 1 GHz, including:
   a. Radiated and conducted signal measurement.
   b. Insertion loss measurements.
   c. Equipment operational characteristics.
   d. Transmission characteristics.

SYSTEM PHILOSOPHY

This proposal states the performance, design, construction, and test requirements for the Honeywell 7899 Automated EMI Measurement System. The Honeywell 7899 optimizes the trade-off between cost and degree of automation, consistent with present technology and testing requirements.

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The Honeywell 7899 system is designed to provide the maximum in time savings, using scanning receivers and X-Y plotters, with a minimum of unnecessary features which contribute little to measurement accuracy and cost reduction. The system allows a maximum amount of operator injection into the measurement process without eliminating the automated features. The operator must be prepared to stop and examine various portions of the data as it is collected to insure correct system and equipment operation. The measuring process must be flexible to permit either manual or automatic operation.

The Annapolis Operation of Honeywell has been engaged in EMI/RFI measurement, equipment test-evaluation-redesign, and instrument manufacture since 1948. The twenty years experience gained by Honeywell as specialists in EMI/RFI work is brought to bear on the practical problems of interference measurement using the 7899 System.

The system operator manually selects, using the 7801 Program Controller, the signal pickup device, the receiver, the calibration generator (substitution techniques are used), the detection mode (narrowband or broadband), and either measure or calibrate operation. The controls of the receiver selected then govern operation of the system.

All accessories are furnished as part of the basic system.

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The signal pickup devices are designed to have constant characteristics over the detection frequency range of their associated receiver. The 7899 System is designed for maximum efficiency for complete sequential spectrum recording, or the 7899 may be used as a parallel device, with several system instruments simultaneously performing testing or scanning functions.

Current probes (or line impedance stabilization networks), rod antenna and preamp, loop, and broadband dipoles (or log conical) can be operator selected at the console. Honeywell does not recommend more than one signal transducer of any type in the shielded enclosure while measurements are being made. While switching from one type pickup device or frequency range, plotter paper and transducer are manually changed.

Determination of whether a signal is "broadband" is a function of detection device bandwidth. The 7899 provides very narrow bandwidths, selectable, which can resolve the harmonics of all but the lowest repetition rate signals. The 7899 system plots either narrowband spectrum harmonics, or peak value broadband impulse signals. The determination of proper bandwidth can be made by monitoring the detected video output with an oscilloscope. If the signal is considered "broadband", the recei-

ver bandwidth may be increased and the Program Controller placed in BROADBAND. Then a peak sample-hold-dump circuit will make available a filtered dc for log conversion and X-Y plotting. The X-Y Y' plotter used in the 7899 System uses two pens, but not simultaneously. The red pen is used to plot data; the green pen is used to plot frequency and amplitude calibration, either broadband or narrowband. Simultaneous plotting of peak and average is not done.

For the wide variety of modulation types encountered in RFI and spectrum surveillance, a wide variety of detector functions is furnished. Wideband and narrowband FM, AM, pulse, CW, and crystal controlled upper and lower sideband are provided from 1 kHz to 1000 MHz. The frequency range from 3 Hz to 1 kHz is baseband operation, with no hetrodyning.

The X-Y Y' plotter is calibrated as part of the transducer / receiver / detector output/log converter / plotter chain using signal substitution. This approach requires that only signal sources be calibrated, rather than the more complex, complete detection instrument series. Harmonic spectrum generators of known spectrum spacing and harmonics amplitude, impulse generators, or external generators may be used to calibrate the system. The data is first plotted, then the selected signal generator is

used to place calibration lines on the X-Y plot. No further calibration is necessary.

Separate X-Y plotter sheets are proposed and recommended for each frequency band. The X-Y plotter furnished may record data on either 8-1/2" x 11" paper, or on 11" x 17" paper. The 11" x 17" size is recommended for maximum signal resolution.

The system log converter, used to convert the linear, dc coupled detector outputs to a log function, has a 60 dB range. The typical narrow-band dynamic range of the receivers used is 70-76 dB. There is ample margin to avoid errors caused by overloading, while at the same time being able to resolve lower level signals in the presence of high level signals.

The Honeywell 7899 System covers the frequency range from 3 Hz to 1000 MHz in 13 bands. Coverage is as follows:

Band 1	3-1000 Hz	Honeywell Model 1863
Band 2	1-500 kHz	Honeywell Model 6869
Bands 3-10	0.5-30 MHz	Honeywell Model 6868
Bands 11 & 12	30-300 MHz	Honeywell Model 6801 (& 6868)
Band 13	300-1000 MHz	Honeywell Model 6802 (& 6801, 6868)

Scanning rates are variable from 2 seconds/band to over 1 hour/band,

depending on the receiver or converter selected. These scan rates are available in either single or recurring sweep.

The entire system is mounted in a single four-bay enclosure, mounted on rubber tire casters, with a single ac service point, and designed for either 110V ac or 220V ac operation. Ample storage space is provided, as shown in Figure 2.

The panadaptor function is proposed as an option.

The Honeywell 7899 System is designed to prevent future obsolescence. The system components and console are built to accommodate later addition of a Honeywell process control computer, such as the DDP-516, for future complete automation.

GENERAL COMMENTS

The Honeywell Model 7899 System is designed using human factors engineering criteria. Instrument panel sizes have been larger than the minimum possible size in order to accommodate the operator. Small knobs, high torque, toggle switches with poor access and similar pitfalls have been avoided. No special parts have been employed - components are standard and interchangeable.

The 7899 System has been designed for stability and repeatability

of measurements. The measurements obtained on the Honeywell 7899 System have a high operator confidence factor. All correction factors required are included in the manuals and extremely detailed operator instructions are included in the manuals to prevent confusion and error. The design objective and philosophy of Honeywell, RF Products, requires a satisfied customer.

TECHNICAL SPECIFICATIONS

Performance

The Automated EMI Measurement System, Honeywell Model 7899, and necessary pickup accessories, such as current probes and antennas, provide automatic scanning and recording from 3 Hz to 1 GHz for making conducted and radiated EMI/RFI measurements. These measurements are automatically recorded using an X - Y Y' plotter. The resulting graph indicates amplitude vs. frequency for the particular measurements being taken. In addition to the X - Y Y' plot, the following outputs are available:

1. I.F. at 455 kHz (6869 and 6868 Receivers).
2. Audio.
3. Video.
4. Oscilloscope spectrum display (option).

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Functional Characteristics

The functional characteristics of the Honeywell 7899 System are as follows:

Frequency Range: 3 Hz - 1 GHz

Frequency Accuracy: Crystal controlled spectrum generator frequency calibration on X-Y plot.

Amplitude Accuracy (Overall): ±2 dB on standard 11" x 17" or 8-1/2" x 11" graph paper.

Tangential Sensitivity: Specification for individual receiving instruments apply. No performance degradation while scanning.

3 Hz - 1 kHz

20 Hz, Conducted:	+20 dB re 1 μA
Radiated Electric:	+ 6 dB/μV/m (2 μV/m)
Radiated Magnetic:	-40 dB nano Tesla

NOTE: Because of the transducer matching problems encountered in this frequency range (below 1 kHz) sensitivity based on field parameters are more realistic than those based on receiver narrowband tangential sensitivities.

1 kHz: Receiver Tangential Sensitivity, 0.02 μV

1 GHz: Receiver Tangential Sensitivity, 1 μV

Amplitude Calibration: Impulse Generator Amplitude Calibration from 20 Hz to 1 GHz.

20 Hz - 250 kHz, Impulse Generator Output variable from +50 to +110 dB/μV/MHz.

	(Insertion of a 60 dB pad will provide a range of -10 to +110 dB/μV/MHz.)
	250 kHz - 1 GHz, Impulse Generator Output variable from 0 to +100 dB/μV/MHz.
Input Impedance:	50 ohms.
Outputs:	3 Hz - 1 GHz: Audio, Wideband, X-Y, IF. (3 Hz - 1 kHz: X-Y and Wideband only.)
Detector Functions Available:	Narrowband FM, FM, Pulse, AM, CW-USB, CW-LSB, Peak with dump.
X-Y Plotter:	The X-Y Plotter is a dual pen device using different colors for measurement and calibration signals. Plotting may be done on either 11" x 17" or 8-1/2" x 11" graph paper.
Variable Scan Rates:	All receivers may be automatically or manually operated. Individual receiver and converter scan rates may be adjusted for the optimum speed for the recording device. Maximum scan time (minimum rate) of over 1 hour/band. (Minimum scan time for receivers alone is 2 sec/band.) All receivers are capable of multiple scanning of a single band.
	The above scan rate data applies above 1 kHz. From 3 Hz to 1 kHz, using the General Radio 1913 System, the maximum sweep rate from 3 Hz to 1 kHz would be 40 minutes.
Power Requirements:	Total System VA: 1000
	The system will operate on 105-130 or 210-260 volts ac, 50/60 Hz only.

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Design Characteristics

1. The Honeywell 7899, excluding pickup accessories, has all components mounted together in a console. This includes field intensity meters, signal monitor oscilloscope, X-YY' plotter, and the programmer which provides selection of the modes to be performed during test. All switches, controls, connectors and read-outs are available on the front panel and so placed as to be convenient to the operator. All functions are labeled in a clear and unambiguous manner.
2. The 7899 System operates with 105-130 or 210-250 volts, ac, 50/60 Hz, including the X-Y plotter.
3. The detector functions are as stated in Functional Characteristics, above.
4. The field intensity meters utilized for E-I measurements are capable of manual or automatic operation.
5. An oscilloscope signal monitor is provided as an option for displaying signals between 15 kHz and 1 GHz.
6. The Honeywell 7899 System has the following outputs: IF, Audio, Video, X-Y, Graphical Plots, Spectrum Display (option).

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System Block Diagram

The Honeywell Model 7899 System Block Diagram is shown in Figure 1. The Block Diagram indicates four major equipment groupings. The 7899 System can be considered as consisting of transducers or pick-up devices, calibration generators, the program controller and associated receivers, and the graphic recorders. The Block Diagram is self-explanatory - substitution measurements are used throughout to maintain accuracy and ease of calibration.

System Layout

The 7899 System configuration is shown in Figure 2, with accompanying schedule of equipments on the following page. All receivers and the program controller are located within arm reach of the operator. A double-width writing surface is provided - storage space for graphic recorder supplies is provided in the left-hand and right-hand equipment bays. Space is provided for future addition of other instruments or the Honeywell Process Control Computer to be included as part of the 7899 System at a future date.

Figure 3 shows the overall dimensions and gives the net weight. AC power service is also shown in Figure 3.

Figure 4, photograph, is a view of the 6868 and 6869 Receivers, the 7801 Program Controller, log converter, and 4894 Spectrum Generator.

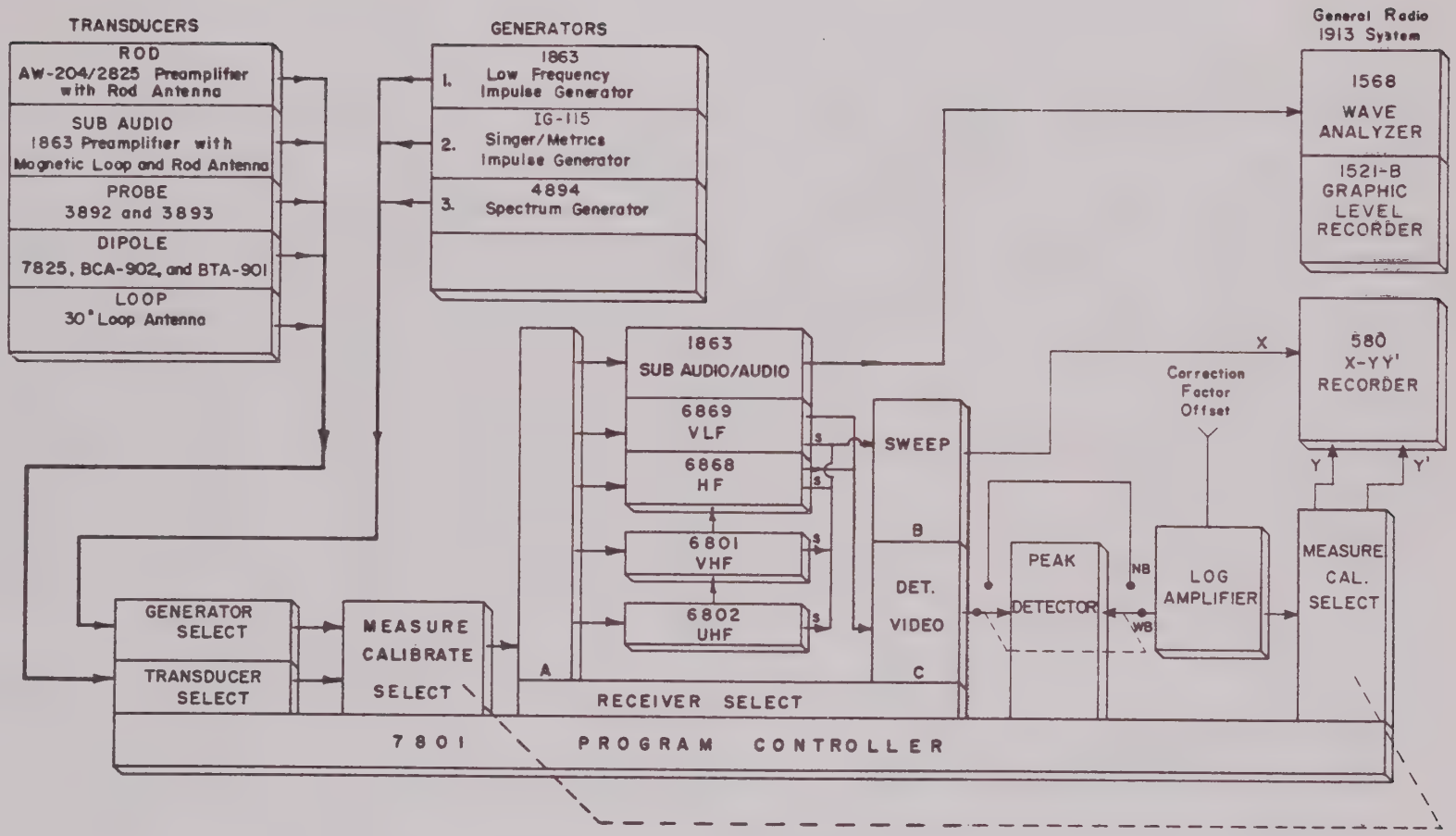

FIGURE 1. SYSTEM BLOCK DIAGRAM

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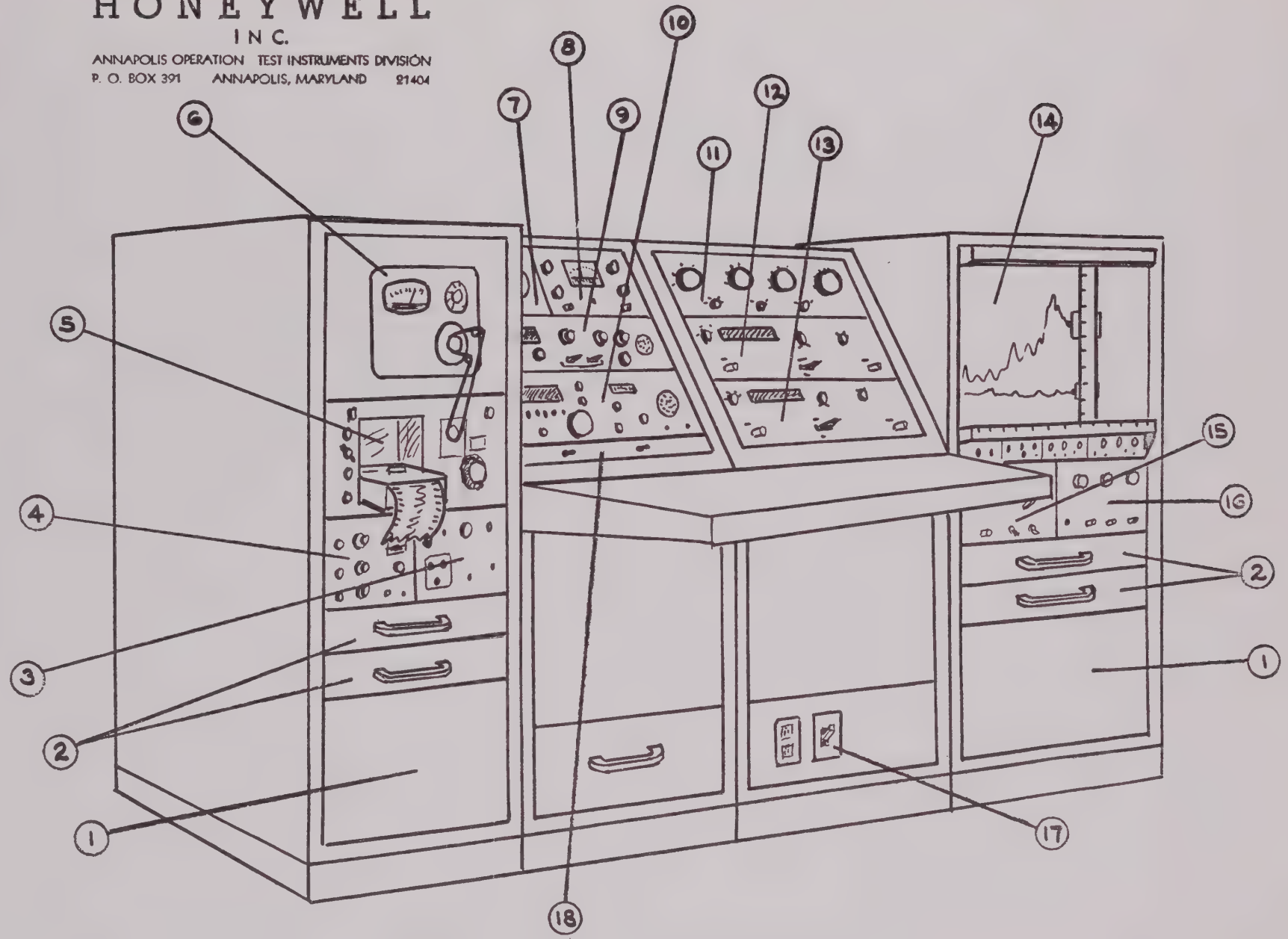

FIGURE 2. SYSTEM LAYOUT, MODEL 7899

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Equipment List - Console (See Figure 2)

1. Blank Panels (4)
2. Drawers (5)
3. 1863 Accessory Module
4. 1863 Main Amplifier
5. General Radio Model 1521-B Graphic Level Recorder
6. General Radio Model 1568 Wave Analyzer
7. AW-204/2825 Control Unit
8. Log Converter
9. 6869 VLF Receiver
10. 6868 HF Receiver
11. 7801 Program Controller
12. 6801 VHF Converter
13. 6802 UHF Converter
14. 580 X-YY' Recorder
15. Singer Metrics Model IG-115 Impulse Generator
16. 4894 Spectrum Generator
17. Primary Power Control Panel
18. System Power Control Panel
19. 8406A Frequency Comb Generator

Equipment List - In Screen Room

1. 1863 Magnetic Loop Antenna
2. 1863 Preamplifier, with Rod Antenna
3. 1863 Tripod
4. AW-204/2825 Preamplifier with Rod Antenna
5. 3892 VLF Probe (20 Hz - 5 MHz)
6. 3893 HF Probe (500 kHz - 32 MHz)
7. 7825 Bi-Conical Antenna (88 MHz - 350 MHz)
8. BCA-902 Bi-Conical Antenna (88 MHz - 350 MHz)
9. BTA-901 Bi-Triangle Antenna (300 MHz - 1000 MHz)
10. Loop Antenna, 30"
11. Conical Log Spiral Antenna

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WT: 1325 Lbs net
POWER: 1000VA at 110/220V

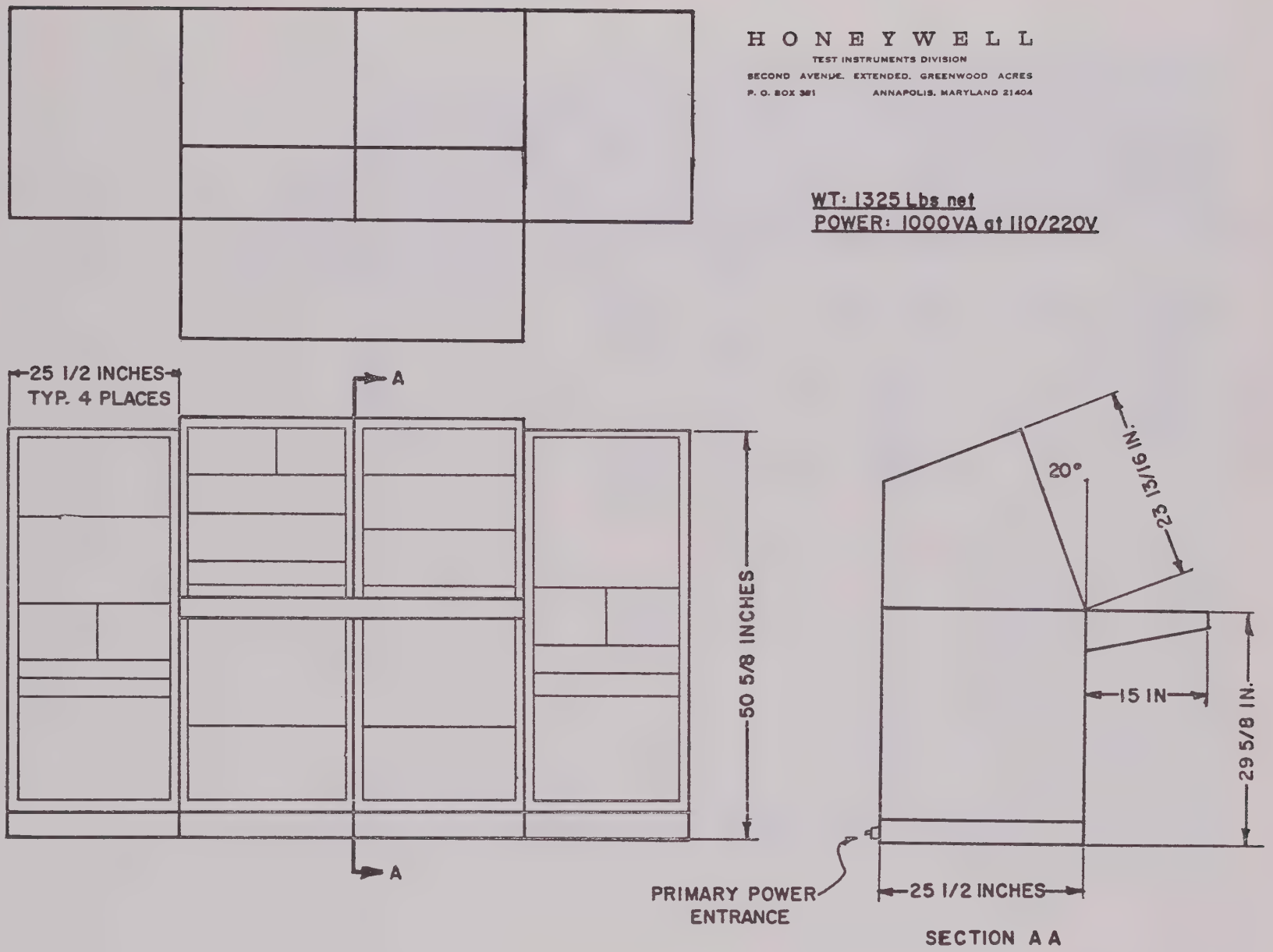

FIGURE 3. OVERALL DIMENSIONS AND WEIGHT, 7899 SYSTEM

Figure 4. View of 6869 VLF Receiver, 6868 HF Receiver, 7801 Program Controller, System Log Converter, and 4894 Spectrum Generator - Part of 7899 Automated Spectrum Surveillance System.

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SYSTEM OPERATION

The 7899 System is designed to perform line conducted signal measurements using either current probes or line impedance stabilization networks as pickup devices, and to perform space radiated electric and magnetic field intensity measurements.

Performance of Conducted Interference Measurements

Conducted interference measurements are carried out using clamp-on current probes or line impedance stabilization networks as the signal pickup transducers. The probes are placed on the power or signal cable to be tested in accordance with the applicable interference specification (such as MIL-STD-826A or MIL-STD-462), or the L.I.S.N. is placed in series with the power line. Signal level measurements are performed utilizing the automatic scanning receivers and plotting devices chosen for the frequency range under investigation by the Program Controller.

3 Hz - 1 kHz

In the frequency range of 3 Hz to 1 kHz, any interference measuring system must use special techniques to achieve meaningful measurements on alternating current power lines due to the inclusion of the power frequency and its most significant harmonics within this range. The Honeywell System utilizes the Honeywell Model 1863 Subaudio/Audio Amplifier,

a battery powered amplification and filtering device which provides internal rejection filters at the fundamental and first two harmonics of any power frequency from 47-63 Hz. This device provides broadband amplification from 3 Hz to beyond 1 kHz. To identify specific interference signals a one percent bandwidth wave analyzing and recording system (General Radio Model 1913) is used in conjunction with the Model 1863.

The signal flow path (through the Program Controller) is as follows. The output of the Honeywell Model 3892 Current Probe is connected to the Model 1863 Subaudio/Audio Amplifier where the power line fundamental and harmonics are removed. The signal is next routed to the General Radio Model 1568 Wave Analyzer where a frequency scan at 1% bandwidth is made (at 20 Hz the bandwidth would be 0.2 Hz and at 1 kHz the bandwidth would be 10 Hz). The output of the wave analyzer is plotted versus frequency by the General Radio Model 1521B Graphic Level Recorder.

If it is desired to make a broadband measurement below 1 kHz the output of the Model 1863 Amplifier may be passed through the Sample Hold and Dump Peak Detector in the Program Controller and then through the System Log Amplifier to provide a dc level to the Honeywell Model 580 X-Y Plotter.

Below 1 kHz, with the 1 kHz Highpass Filter of the Model 3892

Current Probe OUT (not in the circuit) the probe response follows a typical 6 dB per octave characteristic with the 3 dB point at 350 Hz. To determine actual signal levels the probe frequency response plot should be used to obtain the proper correction factor.

1 kHz - 500 kHz

In this frequency range the Model 3892 Current Probe (or the proper L.I.S.N.) is used with the 1 kHz High Pass Filter IN to remove the large amplitude out of band power frequency signals which would otherwise be present when making measurements on ac power lines. The current probe has a flat amplitude response (within ±1 dB) from 1 kHz to 5 MHz. Although the 1 kHz filter may not be needed for measurements on dc power or signal cables it should be left IN since it has no effect on probe amplitude response down to 1 kHz and it may prevent extraneous signals below this frequency from interfering with the desired measurements.

Through the Program Controller the output of the pickup device is connected to the input of the Honeywell Model 6869 VLF Receiver. A bandwidth appropriate to the type of measurement (narrowband or broadband) and compatible with the desired receiver frequency scan rate is set at the receiver front panel. The Wideband Output of the 6869 Receiver is routed

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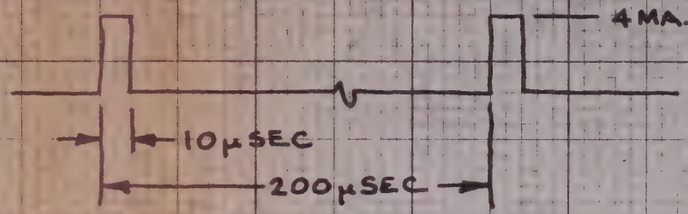
POWER LINE CONDUCTED
3/22/68

① 6869 VLF RECEIVER - 1→500 KHZ
② 3892 CURRENT PROBE - 1→5000 KHZ
③ CURRENT PULSE AS FOLLOWS:



④ VERTICAL SCALE LOGARITHMIC

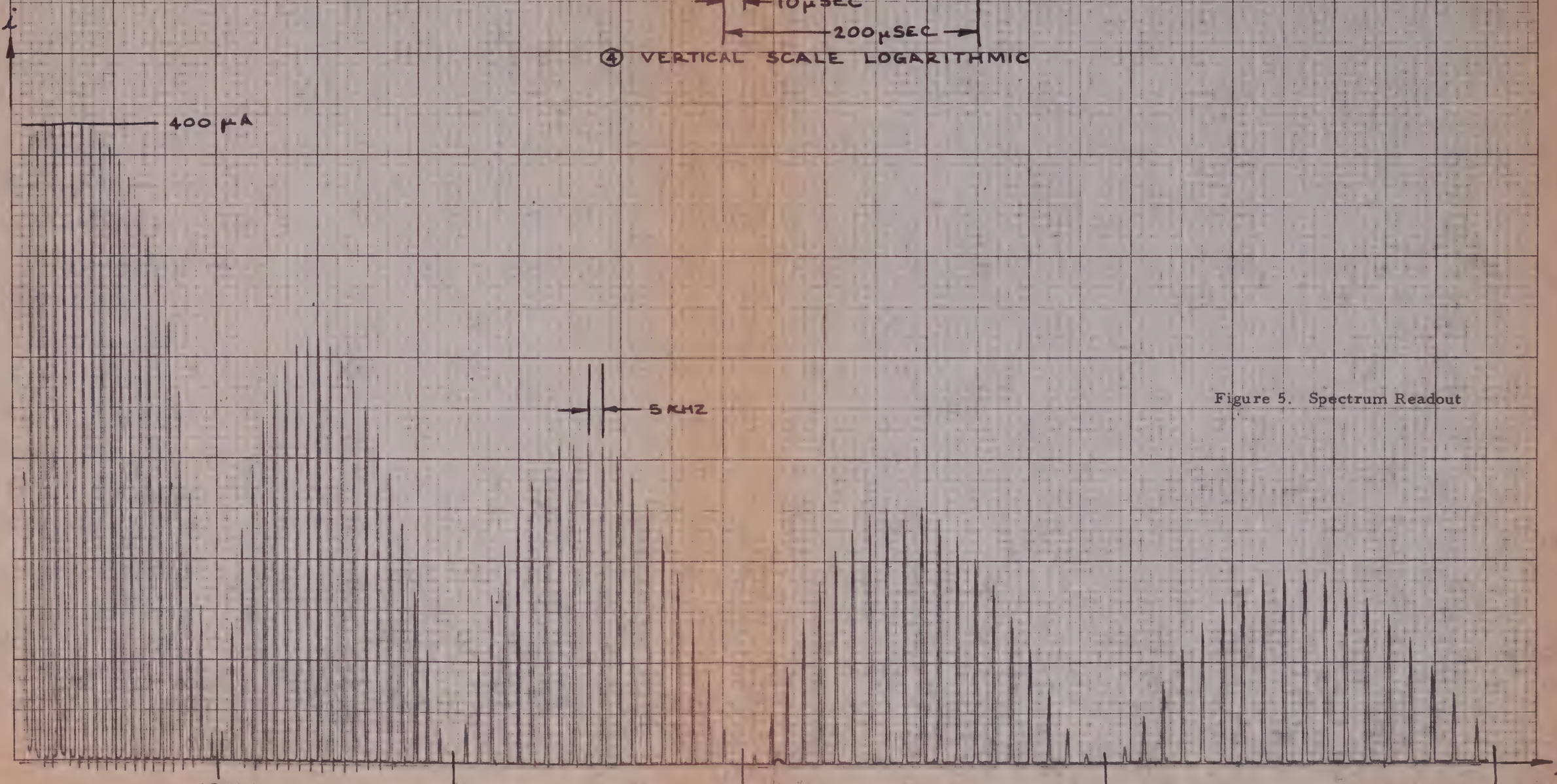


Figure 5. Spectrum Readout

to either the Sample Hold and Dump Peak Detector or directly to the System Log Converter for conversion of the signal to provide a logarithmic amplitude response. In either case (broadband or narrowband) the signal is passed through this System Log Converter before application to the vertical (Y) axis of the Honeywell Model 580 X-Y Plotter. The System Log Converter enables the system to plot signal amplitude directly in dB and also includes an OFFSET control through which amplitude correction factors may be inserted into the system. In the present case a factor of +10 dB would be added to compensate for the Model 3892 Current Probe transfer impedance of −10 dB re 1 ohm. Amplitude calibration or measurement is accomplished through the substitution method by substituting either a broadband impulse generator - Honeywell Model 4857 or Empire IG-115 - (for broadband measurements), or the Honeywell Model 4894 Spectrum Generator (for narrowband measurements) at the receiver input. This is easily accomplished through the Generator Select and Measure-Calibrate controls of the Program Controller. A narrowband sine wave generator could also be used for narrowband measurements if desired.

The horizontal axis of the Model 580 X-Y Plotter is controlled by the sweep output of the Model 6869 Receiver. The full frequency range of the receiver (1 kHz - 500 kHz) is plotted on a 15-inch (frequency) by 10-inch

(100 dB amplitude) graph. Accurate frequency calibration on the plot is achieved through use of the Model 4894 Spectrum Generator.

In the CALIBRATE mode a complete receiver scan is made with the substitution signal source in place of the pickup device and a plot is made of the frequency and amplitude calibration in green ink. The signal level recordings are made in red ink.

500 kHz - 30 MHz

Conducted interference measurements in this frequency range are made with the Honeywell Model 3893 Current Probe (or the proper L.I.S.N.), and the Honeywell Model 6868 HF Receiver. The Model 3893 has an amplitude response flat within ±1 dB from 500 kHz - 30 MHz. The Model 6868 Receiver has eight frequency bands and each band is automatically scanned and plotted on a 10" x 15" X-Y plot.

In all other respects measurements in this range are identical to those in the 1 kHz - 500 kHz frequency range described previously. Choice of broadband or narrowband detection and plotting and choice of substitution source is made at the Program Controller. Receiver sweep rate is set at the receiver front panel.

30 MHz - 300 MHz

Conducted measurements in this frequency range utilize the Honey-

well Model 3896 Current Probe or proper L.I.S.N., and the Honeywell Model 6801 VHF Converter. A dual conversion technique is used with the intermediate frequency output of the Model 6801 (at 21.4 MHz) fed into the Model 6868 HF Receiver which is set for an RF input of 21.4 MHz. The wideband output of the Model 6868 HF Receiver is routed to the X-Y plotter in the same manner as when making measurements in the normal range of this receiver. The X-Y plotter horizontal axis is driven by the sweep output of the Model 6801 VHF converter. All r-f and control switching is automatically accomplished simply by placing the Program Controller "Receiver Select" switch in the VHF position. The only remaining task is to set the 6868 HF Receiver to 21.4 MHz.

Performance of Radiated Interference Measurements

Magnetic Measurements, 3 Hz - 50 kHz

Magnetic field measurements using the Honeywell 7899 Automated EMI Measurement System are accomplished simply by changing the receiver antenna/transducers to loop pickups using the Transducer Select switch on the Program Controller. Absolute field levels are determined by application of antenna correction factors supplied with the system.

3 Hz - 1 kHz

In this frequency range measurements are taken using the Honey-

well Model 1863 Subaudio/Audio Detection System and the General Radio Model 1913, 1% bandwidth wave analyzer.

The Magnetic Loop 1863 is connected to the loop input of the Preamplifier 1863 to provide impedance matching and amplification (calibrated) of the signal.

The output of the Preamplifier 1863 is connected to the transducer input of the Program Controller and will be connected to the Model 1863 Amplifier when the Transducer Select switch is placed in the LOOP position and the Receiver Select is on SUBAUDIO. Narrowband (1% bandwidth) scanning and plotting of the 20Hz to 1 kHz range is now accomplished by the Model 1913 Analyzer and Recorder.

1 kHz - 50 kHz

The Honeywell Model 6869 VLF Receiver and the Honeywell 30" Loop Antenna are used in this frequency range as selected by the Program Controller.

The Detector Output of the Model 6869 Receiver is routed to the Honeywell Model 580 X-Y Plotter via the Spectrum Select (Broadband or Narrowband) of the Program Controller. The detected signal is plotted versus frequency as for any other (conducted or electric field) type of measurement. Absolute signal levels are determined by application of

appropriate correction factors at each interference frequency as determined from the correction factor chart supplied with the system. Correction factors are programmed using the log converter.

Electric Field Measurements, 3 Hz - 1 GHz

3 Hz - 1 kHz

In this frequency range, the 1863 is used for performing a single broadband measurement, and the 1863 with the G-R 1913 is used for performing narrowband measurements.

The 1863 Preamplifier with 82" rod antenna is positioned with respect to the test sample, the cabling connections made, the 1863 battery supply turned "on", and any incident power line frequency ambient bucked out and filtered. The test sample is placed in operation, and the output from the 1863 Main Amplifier observed. The signal level is noted, and the 1863 Accessory Module impulse generator is substituted for the rod antenna at the 1863 Preamplifier. The output from the 1863 Accessory Module impulse generator is adjusted for the same output level from the Main Amplifier when observing the test sample. The field intensity in dB re 1 μV/kHz/m is read directly from the 1863 Accessory Module impulse generator.

When performing narrowband measurements, the G-R 1913 can be used to scan the output from the 1863 Main Amplifier and plot the output spectrum, or the G-R 1568-A Wave Analyzer can be manually tuned to examine the individual narrowband detected signals. Again, as in broad band, a substitution measurement is made using a calibrated generator. Either an available CW generator can be used, or the 4894 Spectrum Generator can be substituted at the 1863 Preamplifier CAL INPUT to determine field intensity.

1 kHz - 500 kHz

In this frequency range the AW-204/2825 Rod Antenna Wideband Amplifier is used with the 6869 VLF Receiver. The AW-204/2825 is positioned with respect to the test sample, cabling connections made, the amplifier control unit placed in MEASURE, and the operating parameter of the 6869 VLF Receiver selected. The 6869 can then be placed in a scanning mode, or manually tuned, the output logged and plotted on the X - Y Y' plot. Hand-written notations on the plotter paper can also be made. The X - Y Y' plotter readout can be directly reproduced using an Ozalid or Xerox process.

500 kHz - 30 MHz

The AW-204/2825 Rod Antenna Wideband Amplifier is used with the

6868 HF Receiver to cover the frequency range from 500 kHz - 30 MHz. The same procedures of data plotting and signal substitution are followed in this portion of the spectrum. The only major difference is that the 6868 HF Receiver covers 500 kHz - 30 MHz in eight bands, which can be automatically stepped or manually selected.

30 MHz - 300 MHz

The 7825 Bi-Conical Antenna and 6801 VHF Converter are used to cover this section of the frequency spectrum. An equalizer is built into the 7801 Program Controller to flatten the response of the 7825 Bi-Conical and provide a constant correction factor for insertion on the X - Y Y ' plot by the Log Converter. The 6801 VHF Converter translates the received signal, with preselection and gain, down to 21.4 MHz for processing by the 6868 HF Receiver.

300 MHz - 1 GHz

The BCA-902 Bi-Conical Antenna and BTA-901 Bi-Triangle Antenna are used with the 6802 UHF Converter to cover from 300 MHz - 1 GHz. The 6802 UHF Converter translates the received signal down to 60 MHz, with preselection and gain, for processing by the 6801/6868 Converter-Receiver combination. Equalizers are built into the 7801 Program Controller to flatten the antenna characteristics and give a more nearly

constant correction factor for automatic plotting.

EQUIPMENT LIST	MANUFACTURER
3 Hz - 1000 Hz	
Model 1863 Main Amplifier	Honeywell
Model 1863 Accessory Module	Honeywell
Model 1863 Preamplifier	Honeywell
Model 1863 Rod and Loop Antennas	Honeywell
Model 1568 Analyzer	General Radio
Model 1521-B Recorder	General Radio
1 kHz - 500 kHz	
Model 6869 Receiver	Honeywell
Model 2825 Preamp (Rod)	Honeywell
Model 3892 Probe	Honeywell
Model 30" Loop	Honeywell
500 kHz - 300 MHz	
Model 6868 Receiver	Honeywell
Model 3893 Probe	Honeywell
30 MHz - 300 MHz	
Model 6801 Converter	Honeywell
Model 7825 Antenna	Honeywell
Model BCA-902 Antenna	Honeywell
Model 3896 Probe	Honeywell
300 MHz - 1 GHz	
Model 6802 Converter	Honeywell
Model BTA-901 Antenna	Honeywell

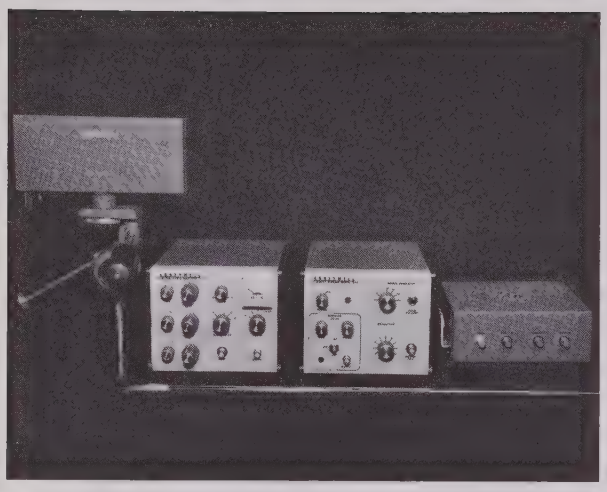
HONEYWELL MODEL 7899

AUTOMATED EMI MEASUREMENT SYSTEM

ANCILLARY	MANUFACTURER
System Log Converter	Honeywell
Model 7801 Controller	Honeywell
Model 580 X-Y Y' Recorder	Honeywell
Model 4894 Generator	Honeywell
Model 8406A Generator	Hewlett Packard
Model IG-115 Generator	Empire (Singer)
Power Control Panels	Honeywell
Console	Honeywell
Model 3858 through 3862 L.I.S.N.'s	Honeywell

OPTION	
Model SM8512 Monitor	CEI

Honeywell



Measure low-level electromagnetic fields in the 3Hz to 1000Hz range with new compact, portable, battery operated system.

Subaudio-Audio Detection System

MODEL 1863

Outstanding Features:

- High sensitivity with low internal noise
- Wide bandwidth for broadband signal detection
- Tunable notch filters to reject power line harmonics
- Operates in any power line environment from 47 to 63 Hz
- Detects electric and magnetic fields independently
- May be used for FED STD 222 testing
- Battery operation for complete power line isolation
- Self-contained battery monitoring and charging circuits
- Compact, light weight, portable

Product Description:

The Honeywell Model 1863 Subaudio-Audio Detection System is an all solid-state, battery powered, detection system with low internal noise and high sensitivity. It has a relatively wide bandwidth of 3 Hz to 1 kHz which permits detection of impulse type signals with greater sensitivity than older subaudio systems covering only 3 to 45 Hz. The units of this system are of modular construction, for ease of maintenance, with maximum attention to internal shielding and grounding to reduce the effects of conducted noise and external stray field pickup. Battery operation of amplifier units insures complete isolation from power line.

The system consists of four basic units; the preamplifier and rod antenna, the magnetic loop antenna with mounting tripod, the main amplifier, and the accessory module.

The Preamplifier Unit contains a mounting base for the 41" telescoping rod antenna, an amplifier section providing 20 db gain and impedance matching of the rod and loop antennas to the 50-ohm output, a four position FUNCTION switch to select the LOOP, ROD, ROD/CAL, or OFF functions, and a battery to supply the operating power.

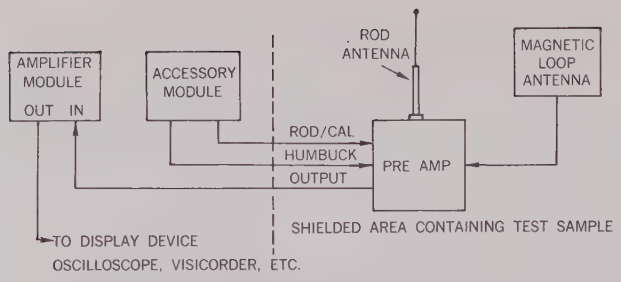
The Magnetic Loop Antenna is designed for the subaudio-audio frequency range of 3 to 1000 Hz. It is mounted on a tripod that is adjustable from 31" to 76" in height and provides full hemisphere coverage. A calibration factor for the loop antenna is furnished for determining field strength.

The Main Amplifier Unit contains tunable notch filters for 47-63, 94-126, and 141-189 Hz, to permit operation in any power line environment from 47-63 Hz without modification. An adjustable 0-50 db step attenuator, adjustable in 10 db steps, provides for detection of high or low level signals. An amplifier with variable gain control, a two battery power supply, and a battery charging circuit are also housed in this unit. A POWER switch provides selection of battery monitoring or recharging functions. A DC voltmeter on the front panel is used to monitor the battery voltages. The Accessory Module contains a humbuck circuit, adjustable in both phase and amplitude, and a low-frequency impulse generator with a calibrated output.

Applications:

The principal application of the Model 1863 Detection System is for FED STD 222 type EMI testing. In addition, it can be used in any application requiring the detection of low-level, time varying electric or magnetic fields. It is particularly adapted to the detection of impulse-type signals such as might be emitted by a relay when it is electrically actuated. The following diagram illustrates a typical set-up for EMI testing.

TEST INSTRUMENTS DIVISION □ ANNAPOLIS OPERATION □ BOX 391 □ ANNAPOLIS, MARYLAND 21404



MODEL 1863 SUBAUDIO-AUDIO DETECTION SYSTEM

Operation:

The Subaudio-Audio Detection System is used to detect either magnetic or electric fields in the 3 to 1000 Hz frequency range.

For electric field reception the FUNCTION switch on the preamplifier is set to ROD position, connecting the one-half electrical meter vertical rod antenna to the preamplifier input. This first stage transforms the signal, with very little loss, from the high impedance level of the rod antenna to working level of a few hundred ohms. Following stages in the preamplifier provide a total voltage gain of 20 db through the preamplifier. A humbucking voltage, variable in phase and amplitude by controls on the Accessory Module, can also be applied to the input stage of the preamplifier. The humbucking voltage cancels the effect of the ambient field signals to prevent overdriving.

For magnetic field reception the FUNCTION switch is set to LOOP position, connecting the magnetic loop antenna through a transformer to the input of the preamplifier.

The output signal from the preamplifier is connected to the main amplifier for further processing. The main amplifier module has a step attenuater providing 0 to 50 db of attenuation, adjustable in 10 db steps, at the input. From the input attenuator the signal is routed through any or all of three notch filters, tunable from 47 to 63 Hz, 94 to 126 Hz, and 141 to 189 Hz, to reduce the effect of the power line frequency and its second and third harmonics. The signal is then applied to a two stage amplifier through a low pass filter. The gain of the first stage is adjustable between 10 and 40 db by the GAIN control and the second stage provides an additional 40 db of voltage gain.

For measurement of detected signals, the Low Frequency Impulse Generator included in the Accessory Module provides an impulse signal with a flat amplitude spectrum from 120 Hz to 2.5 kHz that can be varied from —10 to +60 db re 1 μv/kHz in 1 db steps. For substitution measurements, the impulse generator output can be inserted either at the main amplifier input or through the ROD CAL input of the preamplifier when the FUNCTION switch on the preamplifier is in the ROD CAL position.

Rechargeable batteries, one in the Preamplifier Unit and two in the Main Amplifier Unit, supply power for 10 hours of continuous operation. A charging circuit in the Main Amplifier Unit, operating from 110V, 48-62 Hz power line, provides for overnight recharging of all batteries.

Operational Specifications:

- **Bandwidth:** 3 - 1000 Hz
- **Sensitivity—MDS—@ 1 kHz:**
  - Narrowband Electric Field: 40 db re 1 μV/m or less
  - Broadband Electric Field: 94 db re 1 μV/m/MHz or less
  - Narrowband Magnetic Field: 20 db re 1 μA-T/m/MHz or less
  - Broadband Magnetic Field: 112 db re 1 μA-T/m/MHz or less
- **Dynamic Range:** 50 db narrowband
- **Filtering:** Tunable notch filters—47-63 Hz, 94-126 Hz, 141-189 Hz
- **Humbuck:** Power line frequency—phase and amplitude adjustable
- **Calibration:** Substitution method
  - Impulse Generator: Flat from 120 Hz-2.5 kHz—calibrated from —10 to +60 db re 1 μV/kHz in 1 db steps
- **Input Impedance:**
  - Preamplifier:
    - Rod Antenna: Matched to Rod Antenna
    - Rod Cal: 50 ohms, nominal
    - Loop: Optimized for Loop Antenna
  - Main Amplifier: 50 ohms, nominal
- **Output Impedance:**
  - Preamplifier: 50 ohms, nominal
  - Main Amplifier: 600 ohms, nominal
- **Gain:**
  - Preamplifier: 20 db
  - Main Amplifier: 50 - 80 db, adjustable
- **Output:** 10 V P-P, from Main Amplifier, with 300 μV antenna induced voltage at maximum system gain
- **Power:** Amplifier circuits, battery power — Battery charging circuits and Impulse Generator operate from 110 V, 47-63 Hz
- **Antennas:** 41" telescoping Rod antenna and Magnetic Loop antenna
- **Operating Temperature Range:** 0 to +50°C

Packaging Specifications:

Dimensions:

- Preamplifier: 8" wide x 8" deep x 3" high
- Accessory Module: 7¾" wide x 11" deep x 6⅛" high
- Main Amplifier: 7¾" wide x 11" deep x 6⅛" high
- Magnetic Loop Antenna: 10" wide x 1¾" deep x 4½" high

Weight:	Net:	Shipping:
Preamplifier:	6 lbs.	10 lbs.
Accessory Module:	7 lbs.	10 lbs.
Main Amplifier:	13.5 lbs.	17 lbs.
Magnetic Loop Antenna:	6 lbs.	9 lbs.
Mounting Tripod:	7.5 lbs.	11 lbs.

Ordering Information:

Specify:	Price
Model 1863 Subaudio-Audio Detection System	$3000.00

For ordering purposes list those specifications indicated with check mark (✔).

Honeywell Engineers Sell Solutions

Contact your nearest Honeywell sales engineer today for a demonstration. Your purchase from Honeywell includes an interest that extends beyond the sale. Nationwide metrology service provides repair and calibration for all Honeywell instrumentation.

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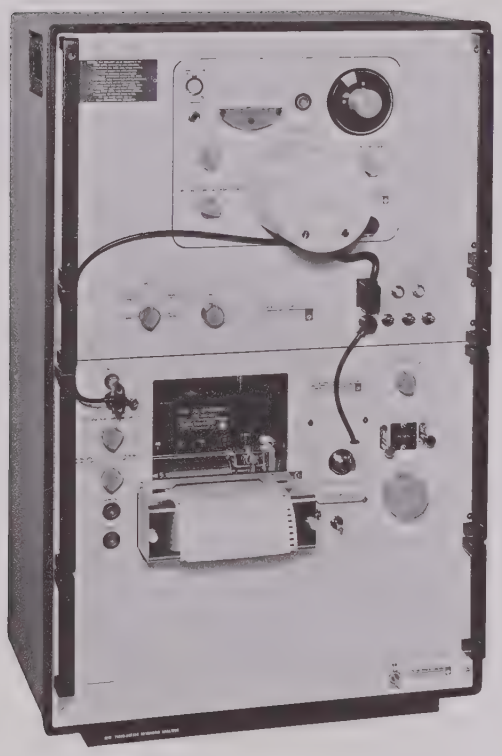
1912 THIRD-OCTAVE RECORDING ANALYZER



The 1912 will make chart records of stepped third-octave analyses of sound and vibration as called for in such standards as Military Standard-740B(SHIPS), ASHRAE 36A-63, and others. In stepped analysis, the analyzer steps from frequency to frequency and dwells a specified time at each while the recorder chart paper feeds continuously. The result is a synchronized, calibrated plot of time-averaged levels in each third-octave band for ease of analysis.

Frequency can also be swept continuously, giving more detailed information than when stepped. See individual descriptions of 1564-A, 1564-P1, and 1521-B.

The 1912 is supplied completely assembled in a cabinet and includes a storage drawer and a system power control, which switches the analyzer battery supply as well as the ac line.

The 1912 includes the following:
- **1564-A Sound and Vibration Analyzer,** rack model
- **1564-P1 Dial Drive**
- **1521-B Graphic Level Recorder** with **40-dB Potentiometer** (1521-9602) and medium-speed motor
- **Chart Paper,** 10 rolls (1521-9460), for stepped analysis

Accessories Available: 1560-P40K Preamplifier and Microphone Set, Chart Paper 1521-9469 for continuous-mode analysis, 80-dB potentiometer, choice of GR microphones and vibration pickups for direct vibration or acoustic analysis.

Mounting: Assembled in cabinet.

Dimensions (width x height x depth): 19¾ x 31¼ x 18½ in. (500 x 800 x 470 mm).

Weight (est): Net, 95 lb (44 kg); shipping, 195 lb (91 kg).

Catalog Number	Description	Price in USA
1912-9700	**1912 Third-Octave Recording Analyzer** (for 115-V, 60-Hz supply)	$3510.00

1913 RECORDING WAVE ANALYZER, 1% BANDWIDTH

This constant-percentage-bandwidth recording analyzer will make high-resolution spectrum plots from 20 Hz to 20 kHz. It is easy to use, having automatic range switching and few controls. Wide dynamic range and the 80-dB potentiometer reduce the need to change sensitivity manually to accommodate widely varying amplitudes. Narrow bandwidth permits separation of closely spaced low frequencies without forfeiting high-frequency resolution; typically, the fiftieth harmonic can be identified. See description of 1568-A Wave Analyzer for more details.

The 1913 is supplied assembled and includes a storage drawer and system power control, which switches the analyzer battery supply as well as the ac line.

The 1913 includes the following:
- **1568-A Wave Analyzer,** rack model, and accessories
- **1521-B** (or -BQ1 for 50-Hz supply) **Graphic Level Recorder** with **40-dB Potentiometer** (1521-9602) and medium-speed motor
- **1521-P3 80-dB Potentiometer** (1521-9603)
- **1521-P10B Drive Unit** (1521-9467)
- **1521-P15 Link Unit** (1521-9615), with 16-tooth sprocket installed (standard 24-tooth sprocket also included)
- **Chart Paper,** 10 rolls (1521-9475), scale 2-20 log, normalized

Accessories Available: 1560-P40J Preamplifier and Adaptor Set.

Mounting: Assembled in cabinet.

Dimensions (width x height x depth): 19¾ x 31¼ x 15¾ in. (500 x 800 x 400 mm).

Weight (est): Net, 82 lb (38 kg); shipping, 170 lb (78 kg).

Catalog Number	Description	Price in USA
	1913 Recording Wave Analyzer, 1% Bandwidth	
1913-9700	for 115-V, 60-Hz supply	$3180.00
1913-9701	for 230-V, 50-Hz supply	on request

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GENERAL RADIO COMPANY
WEST CONCORD, MASSACHUSETTS 01781

PRINTED IN U.S.A.

ACOUSTICS

WAVE ANALYZER

Type 1568-A

- 20 Hz to 20 kHz
- 1% constant-percentage bandwidth

with accessory preamplifier:

- 10 μV full-scale
- 500-megohm input

The 1568-A Wave Analyzer is an important new instrument for high-resolution frequency analyses, whether for measuring vibration and noise components or the spectrum of a complex electrical signal. Recent design advances combine the excellent filter shape of a wave analyzer with the convenient, simple operation of constant-percentage-bandwidth analyzers in a portable, low-cost instrument.

Narrow bandwidth permits separation of closely spaced frequencies; wide dynamic range, high stop-band attenuation, and low distortion allow measurement of small components in the presence of components up to 80 dB larger. These capabilities are vital to the identification of unwanted vibration and noise components. At low frequencies bandwidth is narrower, stability better, and calibration more accurate than those of fixed-bandwidth heterodyne-type wave analyzers.

In combination, the 1568-A and Type 1521-B Graphic Level Recorder produce spectrum plots with as much as a 70-dB recording range. Automatic range switching is included for ease and speed in making spectrum analyses.

The voltage sensitivity and input impedance, adequate for most uses, can be improved to 10 microvolts full-scale and > 500 megohms, respectively, by the use of a Type 1560-P40 Preamplifier. Power for it is supplied at the input connector. See June 1965 *Experimenter* or Catalog S, page 17, for details.

—See *GR Experimenter* for September 1966.

specifications

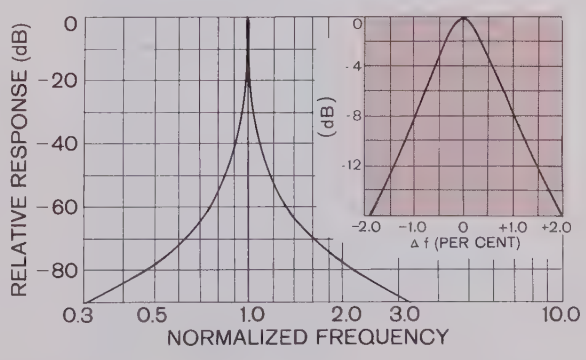
FREQUENCY
Range: 20 Hz to 20 kHz in six half-decade bands.
Dial Calibration: Logarithmic.
Accuracy of Frequency Calibration: 1%.
Filter Characteristics: Bandwidth between 3-dB points on selectivity curve is one percent of selected frequency.

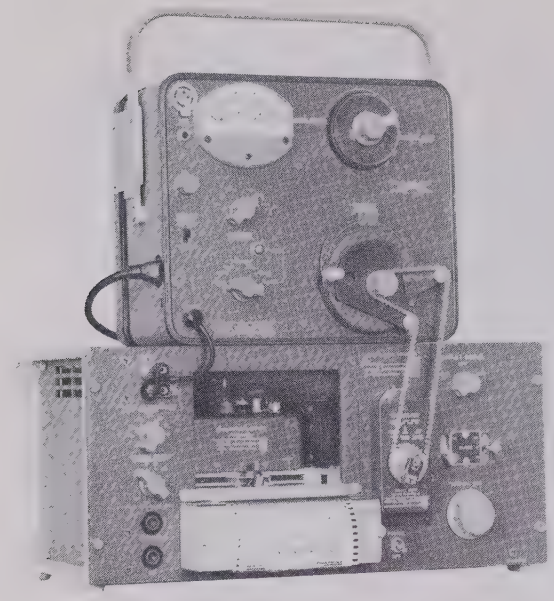
Attenuation at 20% above and at 20% below selected frequency is greater than 50 dB referred to the level at the selected frequency. Attenuation at twice and at one-half the selected frequency is at least 75 dB referred to the level at the selected frequency. Ultimate attenuation is greater than 85 dB.

Uniformity of filter peak response with tuning is ±1 dB from 20 Hz to 6.3 kHz and ±2 dB from 20 Hz to 20 kHz.

INPUT
Impedance: 100 kΩ.
Voltage Range: 100 μV to 300 V, full scale, in 3-10 series steps. Power is supplied at input socket for the Type 1560-P40 Preamplifier,* which extends the sensitivity to 10 μV, full scale, and increases the input impedance to more than 500 MΩ.

*For complete details see Catalog S, page 17.





The analyzer coupled to the 1521-B Graphic Level Recorder for automatic plotting of frequency spectra.

Distortion: Input-circuit distortion is lower than —80 dB relative to input-signal level.

OUTPUT

Impedance: 6000 Ω. Any load can be connected.

Voltage: At least one volt open circuit when meter reads full scale.

Crest-Factor Capacity: Greater than 13 dB.

Output Meter: In addition to normal-speed mode, meter has slow-speed mode for manual measurements of noise.

GENERAL

Analyzing Range: 80 dB. Components of an input signal that differ in amplitude by as much as 80 dB can be measured.

Automatic Recording: Automatic range switching is provided to allow convenient, continuous spectrum plotting when the Type 1521 Graphic Level Recorder is used. Medium-speed motor is recommended. Chart paper is Catalog No. 1521-9475. Frequency scale is logarithmic, 10 inches per decade; vertical scale is 4 inches for 20, 40, or 80 dB, depending on the potentiometer used in the recorder.

Amplitude Calibrator: A built-in, feedback-type calibration system permits amplitude calibration at any frequency.

Accessories Supplied: CAP-22 Power Cord; 1568-2090 Detented Knob and Dial Assembly, used to facilitate measuring the components of an input signal as a percentage or in decibels with an arbitrary voltage reference.

Accessories Available: Preamplifier and Adaptor Set, Type 1560-P40J*; Link Unit Type 1521-P15, with Sprocket Kit Type 1521-P16 for mechanical coupling to 1521-B Graphic Level Recorder equipped with Drive Unit 1521-P10B; Chart Paper 1521-9475.

Power Supply: 100 to 125 or 200 to 250 V, 50 to 60 Hz. 2 W for normal operation, 3.5 W for battery charging. A rechargeable nickel-cadmium battery is supplied. Battery provides about 20 hours of operation when fully charged and requires 16 hours for charging. Internal charger operates from the power line.

Mounting: Flip-Tilt case, rack model available.

Dimensions (width x height x depth): Portable, with case closed, 13¼ x 13 x 8¼ in (340 x 330 x 210 mm); rack, 19 x 12¼ x 5 in (485 x 310 x 130 mm).

Weight: Net, 21½ lb (10.0 kg); **shipping,** 27 lb (12.5 kg).

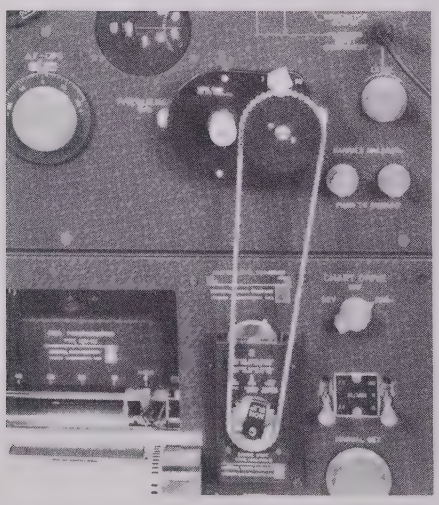
Catalog Number	Description	Price in USA
1568-9701	**Type 1568-A Wave Analyzer,** Portable Model	**$1350.00**
1568-9820	**Type 1568-A Wave Analyzer,** Rack Model	**1350.00**
1560-9510	**Type 1560-P40J Preamplifier and Adaptor Set***	**184.00**
1521-9615	**Type 1521-P15 Link Unit**	**30.00**
1521-9616	**Type 1521-P16 Sprocket Kit**	**20.00**
1521-9475	**Chart Paper**	**2.75**

*For complete details see Catalog S, page 17.

- accessory for 1900-A Wave Analyzer and 1910-A Recording Wave Analyzer
- choice of normal or expanded chart frequency scale

LINK UNIT

Type 1900-P3



Use the 1900-P3 Link Unit when making high-resolution frequency-spectrum plots with the 1900-A Wave Analyzer. It provides a choice of chart scale factors: 100 Hz/2 inches or 1000 Hz/2 inches, selectable by a front-panel control. The expanded 100 Hz/2 inches scale factor is of particular value in realizing the full resolution potential of the wave analyzer's 3-Hz bandwidth. Chart paper 1521-9496 is used for both speeds.

Weight: Net, 1 lb (0.5 kg); **shipping,** 4 lb (1.9 kg).

—See *GR Experimenter* for August 1966.

Catalog Number	Description	Price in USA
1900-9603	**Type 1900-P3 Link Unit**	**$55.00**

GENERAL RADIO COMPANY WEST CONCORD, MASSACHUSETTS, U.S.A.

In Europe and Middle East
HELENASTRASSE 3, 8008 ZURICH, SWITZERLAND

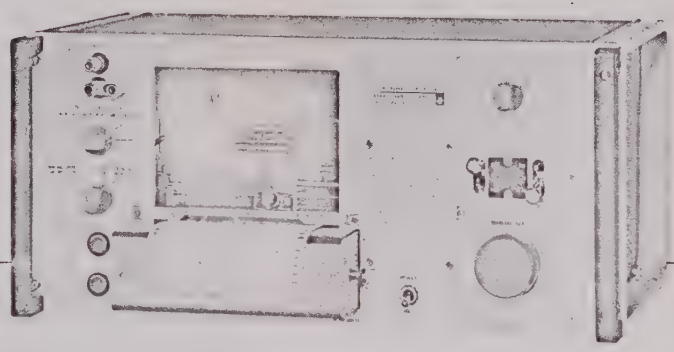
In United Kingdom
BOURNE END, BUCKINGHAMSHIRE, ENGLAND

PRINTED IN U.S.A.

GRAPHIC LEVEL RECORDER

Type 1521-B

- 4.5 Hz to 200 kHz
- 1-mV ac sensitivity
- linear dB plot of rms ac-voltage level
- 20-, 40-, or 80-dB range
- convenient, disposable pens



The 1521-B is a completely transistorized, single-channel, servo-type recorder. It produces a permanent, reproducible strip-chart record of ac-voltage level as a function of time or some other quantity.

Most often these are records of the frequency response of a device or the frequency spectrum of noise or of a complex electrical signal. The Graphic Level Recorder can be mechanically or electrically coupled to various GR analyzers and oscillators to synchronize the frequency scale of the chart record with the instrument's calibrated tuning-control dial. Such combinations of instruments are available factory assembled or as individual components to add to existing equipment. (See preceding pages.)

Owing to the high stability of its reference voltage and amplifier gain, the 1521 can be calibrated and used as a recorder of absolute level.

With a sound-level meter, the recorder can plot sound levels over a wide dynamic range as a function of time. The writing speed is sufficiently high for the measurement of reverberation time and other transient phenomena.

The wide range of paper speed facilitates long-period studies of the noise produced by traffic and machinery, as well as of short-duration transients.

The frequency response can be extended downward to 4.5 Hz at the slower writing speeds. Writing speeds and low-frequency cutoff are selected by a single switch.

Changes of range are easily accomplished by use of a 20-dB or an 80-dB potentiometer in place of the standard 40-dB unit. With the 80-dB unit, the maximum writing speed is 300 dB/second. The slow writing speeds filter out abrupt level variations, yielding a smoothed plot without loss of accuracy.

A linear potentiometer is available, which can be used for dc recording and is easily substituted for the logarithmic ac potentiometers.

— See **GR Experimenter** for September 1964.

specifications

Recording Range: As supplied, 40 dB full-scale; 20-dB and 80-dB ranges are also available. For dc recording, 0.8 to 1 V (0.8 to 1.0 mA) full-scale, with zero position adjustable over full scale.

Frequency Response and Writing Speed

Level Recording: High-frequency response ±2 dB to 200 kHz. Low-frequency sine-wave response depends on writing speed, as shown in following table:

Writing Speed (approx) in./s with 0.1-inch overshoot	Low-Frequency Cutoff Hz (less than 1 dB down)
20	100
10	20
3	7 (3 dB down at 4.5 Hz)
1	7 (3 dB down at 4.5 Hz)

Dc Recording: 3 dB down at 8 Hz (pk-pk amplitude less than 25% of full scale).

Potentiometer Linearity

20-, 40-, 80-dB Potentiometers: ±1% of full-scale dB value plus a frequency error of 0.5 dB at 100 kHz and 1.5 dB at 200 kHz.

Linear Potentiometer: ±1% of full scale.

Resolution ±0.25% of full scale.

Max Input Voltage: 100 V ac.

Input Attenuator: 60 dB in 10-dB steps.

Input Impedance: 10,000 Ω for ac level recording; 1000 Ω for dc recording.

Max Sensitivity: 1 mV at 0 dB for level recording; 0.8 or 1 V full-scale for dc recording.

Paper Speeds

High-speed motor (normally supplied): Paper speeds of 2.5, 7.5, 25, 75 in./min. Used for high-speed-transient measurements and with Type 1304 Beat-Frequency Audio Generator.

Medium-speed motor (supplied on request): Paper speeds of 0.5, 1.5, 5, 15 in./min. Used with analyzers and in level-vs-time plots.

Low-speed motor (supplied on request): Paper speeds of 2.5, 7.5, 25, 75 in./h. Used for level-vs-time measurements from 1 to 24 h.

External Dc Reference: An external dc reference voltage of from 0.5 to 1.5 V can be applied internally to correct for variations of up to 3 to 1 in the signal source of the system under test.

Detector Response: Rms within 0.25 dB for multiple sine waves, square waves, or noise. Detector operating level is 1 V.

Chart Paper: 4-inch recording width on 5-inch paper. All rolls are 100 feet long. See full list of charts below.

Accessories Supplied: 40-dB potentiometer, 12 disposable pens with assorted ink colors, 1 roll of 1521-9428 chart paper, power cord, spare fuses, 1560-P95 Adaptor Cable (phone to double plug).

Accessories Available: Potentiometers, chart paper, pens, high-, medium-, and low-speed motors, drive and link units.

Power Required: 105 to 125 or 210 to 250 V, 50 or 60 Hz, 35 W.

Mounting: Rack-Bench Cabinet.

Dimensions (width x height x depth): Bench model, 19 x 9 x 13½ in. (485 x 230 x 345 mm); rack model, 19 x 8¾ x 11¼ in. (485 x 225 x 290 mm).

Weight: Net, 50 lb (23 kg); shipping, 62 lb (29 kg).

Catalog Number	Description	Price in USA
	Graphic Level Recorder	
1521-9812	**1521-B,** Rack Model (for 60-Hz supply)	$1250.00
1521-9802	**1521-B,** Bench Model (for 60-Hz supply)	1250.00
1521-9507	**1521-BQ1,** Rack Model (for 50-Hz supply)	on request
1521-9506	**1521-BQ1,** Bench Model (for 50-Hz supply)	on request

PATENT NOTICE. See Notes 1 and 18.

HONEYWELL
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NEW PROGRAMMABLE VLF/LF RECEIVER OR ANALYZER

WITH A SYSTEMS APPROACH

MODEL 6869

A single band, 1-500 kHz Automated Detection Instrument for a variety of analysis and measurements problems.

HONEYWELL'S MODEL 6869 VLF/LF RECEIVER/ANALYZER

WITH A COMBINATION OF PERFORMANCE FEATURES GREATER THAN IN ANY PREVIOUS INSTRUMENT

OUTSTANDING FEATURES:

- Low Noise Figure
- High Sensitivity
- One Band Frequency Coverage
- Voltage Tuning
- Digital Frequency Readout
- Choice of Six Bandwidths
- Modular I.F. Filters for Bandwidth Change
- Wide Dynamic Range
- 50 or 600-ohm Input Impedance
- AM, FM, NFM, CW, FSK Detection
- High Stability and Digital AFC
- Local or Remote, Programmable Control
- High Image and I.F. Rejection
- Low Intermodulation and Cross-modulation Distortion
- Low Oscillator Radiation and Conductance
- Wide Environmental Operating Range

The 6869 VLF Receiver/Analyzer features one band frequency coverage from 1-500 kHz with voltage tuning and digital frequency readout. The receiver/analyzer may be manually tuned, internally swept, or externally programmed with a dc voltage. Internal sweep may be single with manual triggering, single sweep with external pulse trigger, or recurring internal sweep. Maximum sweep rate is automatically determined by the I.F. bandwidth selected.

A wide variety of detectors is available in the Model 6869, AM, FM, NFM, Pulse,

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and ±1.7 kHz crystal BFO for upper and lower side bands. Either manual I.F. gain or AGC, as required, is switch selectable. I.F. bandwidth may be varied in a 1-3-10 sequency from 100 Hz to 30 kHz. These I.F. bandwidths may be front panel switch selected or remotely programmed using a contact closure to ground.

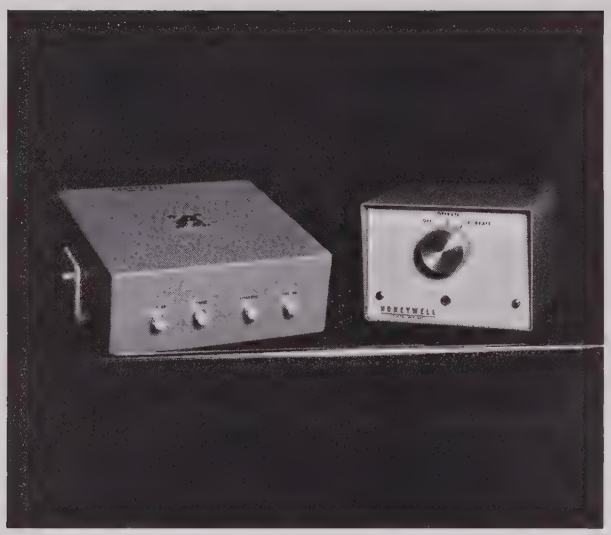
The digital frequency readout, included in the Model 6869 as a standard feature, greatly expands the capability of the 6869 VLF Receiver/Analyzer. The frequency to which the instrument is tuned is displayed to four places and, when in local tuning, the receiver/analyzer local oscillator is locked to the counter, to the nearest 10 Hz set by the last digit switch. The 6869 has ±10 Hz stability at any frequency from 1-500 kHz. Counter clock stability is 0.5 PPM. In the illustration, the 6869 is tuned to 312.05 kHz.

SPECIFICATIONS:

Frequency Range	1-500 kHz in one band, voltage tuned, lever action switch control, no multi-turn knobs, lower band limit 900 Hz.
Noise Figure	1-100 kHz, less than 6 dB; 100-500 kHz, less than 3 dB.
Sensitivity (50-ohm input)	AM, 1.0 μv for 10 dB (S + N)/N; FM, 1.5 μv @ 8 kHz deviation @ 1 kHz rate for 20 dB (S + N)/N; NFM, 0.8 μv @ 2.0 kHz deviation @ 0.4 kHz rate for 20 dB (S + N)/N; PULSE, 20dB re 1 μv/MHz.
Digital Frequency Readout	Four digit display, fifth digit (±10 Hz) front panel switch. Stable 0.5 PPM clock. Frequency available in BCD format at rear panel connector. Digital automatic frequency control gives ±10 Hz stability by locking local oscillator to counter crystal clock.
Reception	AM, FM, NFM, PULSE, AM-USB, AM-LSB, CW, FSK
Voltage Tuning	Local mode, one band from 1-500 kHz by raising or depressing coarse or fine tuning lever switches; sweep mode, internal voltage sweep, may be single or recurring, maximum sweep rate automatically adjusted by I.F. bandwidth control to prevent loss of signal resolution; remote mode, external DC voltage. Internal sweep may also be triggered by external pulse

	and may be manually interrupted and restarted at same point in sweep.
Input Impedance	50 or 600 ohms, front panel switch, transformer coupled with high pass filter cut-off below 1 kHz. Both BNC and Twinax connectors provided.
Input Attenuator	0/-20/-40/-60 dB, front panel switch.
I.F. Bandwidths	100 Hz, 300 Hz, 1 kHz, 3 kHz, 10 kHz, 30 kHz front panel switch. Bandwidth may be programmed by contact closure through connector on rear panel. Band filters are modular and easily changed to accommodate changing detection requirements.
Image Rejection	Greater than 60 dB.
I.F. Rejection	Greater than 70 dB.
Dynamic Range	Manual or AGC, 80 dB.
Digital AFC	Holds receiver local oscillator to within ±10 Hz of frequency selected by combination of tuning switches and last digit switch.
BFO	Crystal controlled at ±1.7 kHz off zero beat. Crystals may be changed for different upper and lower sidebands.
Outputs	Front panel: audio phones, 3.2 ohms, 10 volts peak-peak open circuit, AC coupled, may be short-circuited without damage; Wideband, 10 volts peak-peak into 50-ohm load, DC coupled, ±0.5 dB to beyong 30 kHz, output may be short-circuited without damage. Rear panel: I.F. output @ 455 kHz, 50 ohms; Wideband output (same as front panel wideband); Audio out (same as front panel); sweep voltage output, 600 ohms, DC coupled, zero offset voltage. BCD frequency readout from counter.
Inputs	Front panel: R.F. input, BNC and Twinax. Rear panel: remote tuning input, DC coupled, protected against overvoltage; trigger input for

Honeywell



Provides a rapid means for remote measurement of extremely low level RF in the 14 kHz to 30 MHz range.

Wideband Amplifier System

MODEL AW-204/2825

Outstanding Features:

- Increased Preamplifier sensitivity
- One band — no tuning
- Flat gain with Frequency
- Low noise
- Remote operation
- Remote calibration

All solid-state, light, compact

Product Description:

The Honeywell Model AW-204/2825 Wideband Amplifier System consists of an Antenna Unit with an 82" telescoping vertical rod antenna, a Control Unit, and associated interconnection cables. The Antenna Unit may be mounted horizontally or vertically on a standard tripod or bolted to a ground plane. The Control Unit is designed for bench mounting.

All interconnections between the Antenna Unit, Control Unit, Calibrated Signal Source and EMI/RFI measuring equipment may be made using the four ten-foot and four twenty-foot RG-55/U coaxial cables supplied with the system.

The Antenna Unit has a screw base mounting pad for attaching the telescoping antenna and BNC type connectors for signal and power cable connection. The Antenna Unit contains a transistorized low-noise broadband amplifier with a high impedance input for minimum loading of the rod antenna and a nominal output impedance of 50 ohms. The Antenna Unit also contains a relay for switching the amplifier input to either the rod antenna or the CAL INPUT connector which allows the operator to determine the strength of interferance signals by the signal substitution method from a remote position during tests.

The Control Unit operates from 105-125 V AC, 60 Hz power, and supplies DC power to the Antenna Unit. The Control Unit also contains the necessary circuits for remotely operating the OPER/CAL relay in the Antenna Unit.

Applications:

The AW-204/2825 System is designed to provide a rapid means of remote pick-up of low-level, radiated electric field signals in the 14 kHz to 30 MHz frequency range. The unit supplies the RF input to Broadband Amplifier or Spectrum Analyzer Detection and Monitoring systems for EMI/RFI testing and may also be used as an Antenna Preamplifier system for communications receivers. The system provides good sensitivity over the entire frequency range and is usable at frequencies well below 14 kHz. The system is equipped for performing field strength measurements, remotely, using the signal substitution technique for maximum accuracy.

The following diagram illustrates a typical EMI test set-up showing the interconnection of the units.

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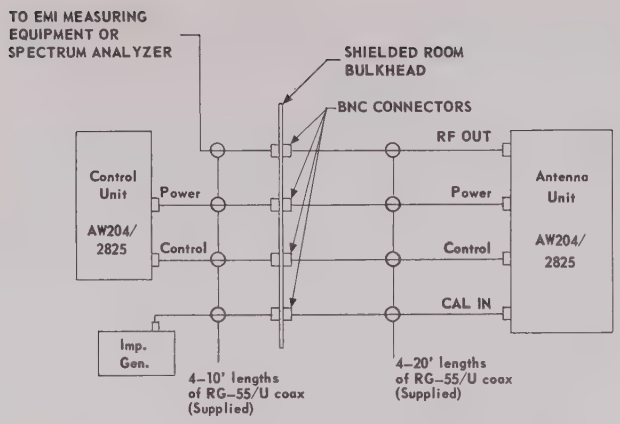
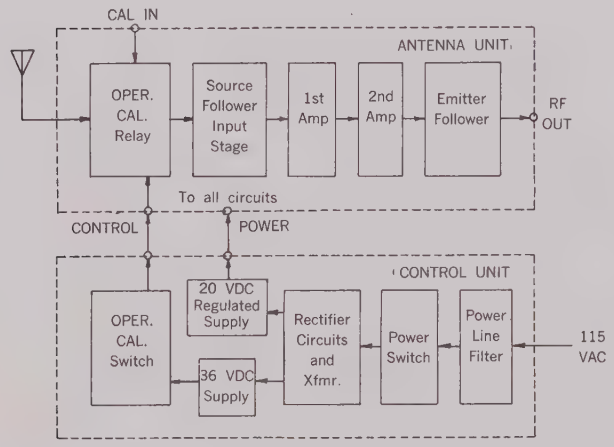


Operation:

The Amplifier sections and the remotely controlled relay in the Antenna Unit and the filter, power supply, and control switch in the Control Unit are shown in the following block diagram.

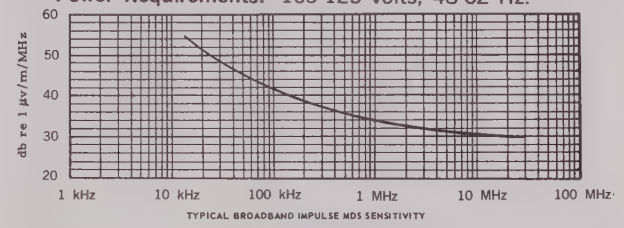


Radiated electric field signals are capacitively coupled to the rod antenna and are applied to the source follower input stage through the OPER/CAL relay when the relay is in the OPERATE position. In the CALIBRATE position the calibrating input signal is coupled through a capacitor (equivalent to rod antenna capacitance) to the input stage. The high input impedance of the source follower stage provides optimum loading for the rod antenna over the range of 14 kHz to 30 MHz. The signal is then amplified by two stages of amplification and applied to an emmiter follower output stage. The emmiter follower output stage provides the 50-ohm output impedance to drive EMI/RFI detection devices or communications receivers through long lengths of coaxial cable.

The Control Unit operates from 105-125 volts AC, 60 Hz power. The line voltage is applied to a low-pass RFI-type filter, through a fuse and power switch, and then to a step-down power transformer. The power supply is a full wave bridge network with two outputs. The first output is filtered and zener regulated to 20 VDC. This output is used to power the amplifier circuits in the Antenna Unit. The other output of the power supply is used to operate the control relay in the Antenna Unit, and is applied to the relay only when the control switch is in the CALIBRATE position. When the Control switch is in the OPERATE position the relay in the Antenna Unit is de-energized and the input of the amplifier is connected to the rod antenna.

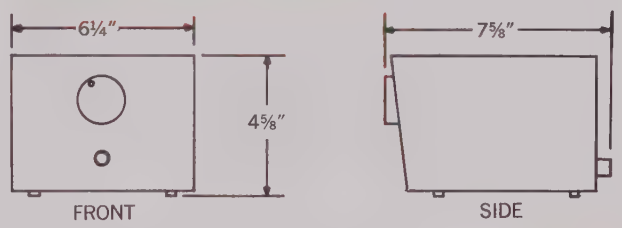
Operational Specifications:

- **Frequency Range:** 14 kHz to 30 MHz in one band. Gain flat, ± 1 db.
- **Input Impedance**
  - **Antenna Input:** High impedance match to rod antenna.
  - **Calibrate Input:** 50 ohms.
- **Output Impedance:** 50 ohms.
- **Dynamic Range**
  - **Narrowband:** 120 db typical.
  - **Broadband:** 30 db typical. (Spectrum lines spaced at 60 Hz intervals from 14 kHz to 30 MHz.)
- **Antenna:** Telescoping rod, adjustable to 41" and to 82".
- **Sensitivity**
  - **Broadband MDS:** See curve below.
- **Connectors:** Type BNC.
- **Power Supply:** Self-contained, solid-state, regulated.
- **Power Requirements:** 105-125 volts, 48-62 Hz.

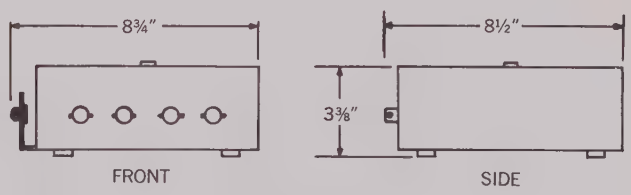


TYPICAL BROADBAND IMPULSE MDS SENSITIVITY

Packaging Specifications:



CONTROL UNIT



ANTENNA UNIT

Net Weight: 8 pounds, 4 pounds each unit.
Shipping Weight: 12 pounds (approximate).

Ordering Information:

Specify:	Price
Model AW-204/2825 Wideband Amplifier System	$ 880.00

For ordering purposes list those specifications indicated with check mark (✔).

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HONEYWELL
INC.

MEASURE AUDIO AND RF CURRENT WITHOUT LINE CONNECTION

CURRENT PROBE, MODEL 3892

OUTSTANDING FEATURES:

- Wide Frequency Range
- Excellent Low Frequency Response
- Constant Transfer Impedance
- High Power Line Current AC or DC
- Filter for Removing Power Line Harmonics
- Extremely Low Reflected Impedance
- Useful to Below 10 Hz

PRODUCT DESCRIPTION:

The clamp-on current probe permits direct measurement of current in a conductor without disturbing the measured circuit. The Honeywell 3892 Current Probe enables a receiver, oscilloscope, voltmeter, or other instrumentation to accurately and rapidly measure current. Measurement is made by clamping the probe around the conductor and observing the probe output voltage. Since the Model 3892 is completely shielded, accurate measurements can be made without measurable effects from stray fields. Position of the conductor within the probe aperture does not affect the probe accuracy.

Honeywell current probes maintain specified transfer impedance and frequency response unaffected by the AC or DC power current flowing in the conductor. This is particularly important when measuring harmonic currents or radio-frequency currents superimposed on primary power current. The Honeywell 3892 Current Probe can have over 300 amperes, either DC or AC power, flowing in the conductor without affecting the probe characteristics.

The 3892 probe is a split secondary, single turn primary, toroidal transformer with a known transfer impedance. Transfer impedance is defined as the output voltage divided by the input (primary) current. Knowing the probe transfer impedance, the current in the inserted probe primary can be calculated.

OPERATION:

The probe is clamped around the conductor carrying the current to be measured, the probe output BNC connected through a 50-ohm, terminated cable to the detec-

tion instrument, and the probe output voltage observed. The probe voltage, divided by the transfer impedance equals the primary current, or the current to be measured. If measurements are in terms of dB above a reference level, then the transfer impedance of the probe in dB re one ohm is subtracted from the output voltage in dB to obtain current in dB.

The Honeywell 3892 probe has a transfer impedance of -10 dB referenced to one ohm when terminated in a 50-ohm load. For every microvolt output voltage there must be 3.16 microamperes in the primary conductor. Transfer impedance is 0.316 ohms, and 0.316 ohms is -10 dB below one ohm. If one microvolt probe output is observed, then the measured current is 3.16 microamperes. If the probe output is 0 dB re 1 μvolt, then the measured current is +10 dB re 1 μamp.

APPLICATION:

Honeywell current probes have been developed as a necessary accessory for spectrum analysis of complex current waveforms and for automated EMI/RFI measurement. The useful frequency range of the 3892 Current Probe can be switch selected. The high pass filter included in the Model 3892 acts to remove power line harmonics below 1 kHz. The high pass filter can be switched out, and the natural probe response determines the output voltage. Without the filter, the 3892 Current Probe response rolls off at a -6 dB per octave rate below 1 kHz. The Honeywell Model 3892 Current Probe was designed for use with the Honeywell Model 6869 VLF Receiver, the frequency ranges were designed to coincide, but the 3892 probe may be used in any current measuring or monitoring application.

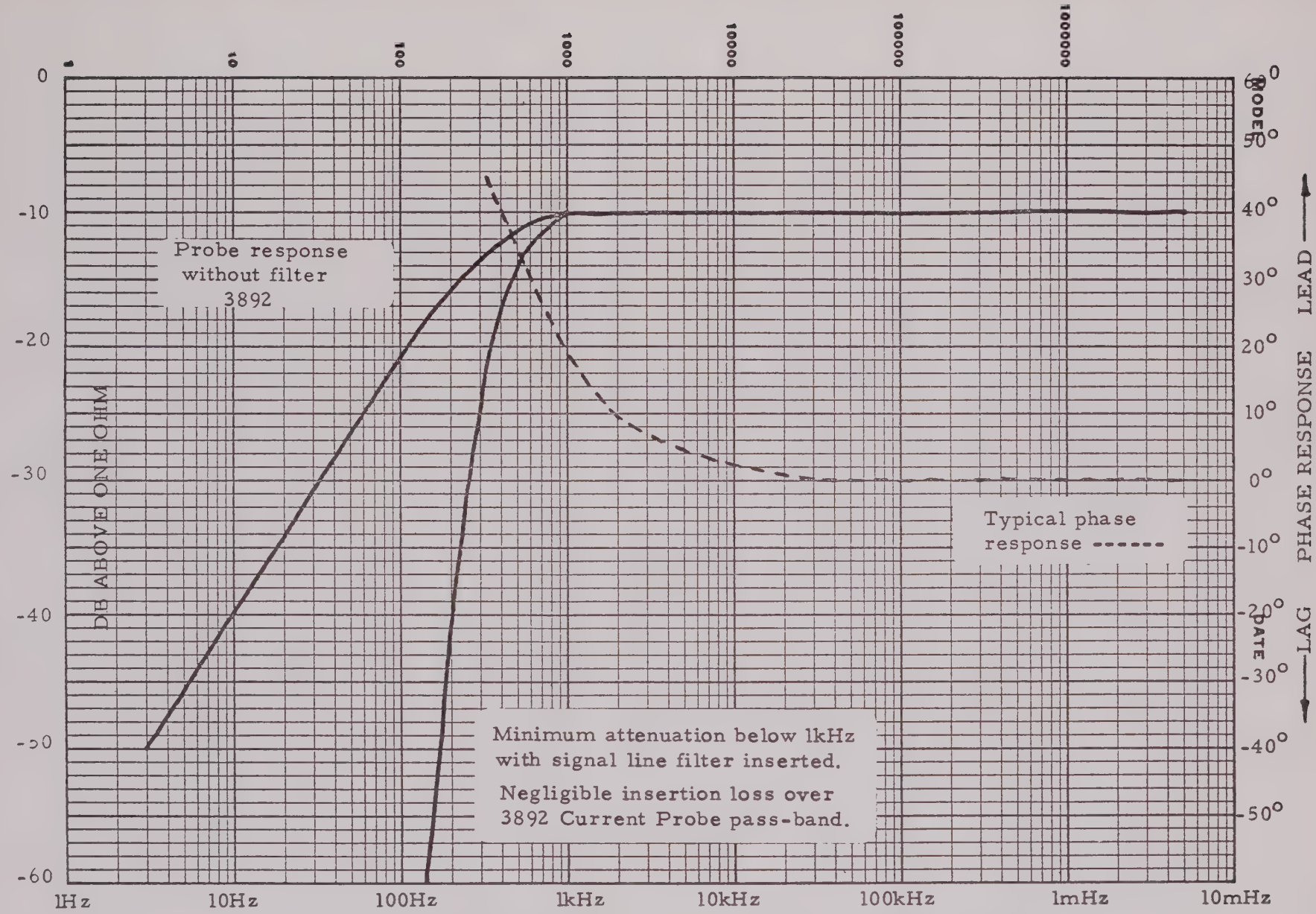
Typical applications for the Model 3892 Current Probe are:

1. Replacement of line stabilization networks in RFI measurements.
2. Measure normal functioning of electrically powered equipment.
3. Measurement of complex current waveforms in hazardous environments, no interruption of power required.
4. General monitoring device.
5. Pick-up device for oscilloscopes, data acquisition, signal conditioning, telemetry, light beam and magnetic recorders.

OPERATIONAL SPECIFICATIONS:

✓FREQUENCY RANGE

1 kHz - 5 MHz ± 1 dB, useful from 3 Hz to above 20 MHz.
Without filter, -6 dB per octave below 1 kHz, see curve
With filter, response down -60 dB below one ohm at 120 Hz.



TRANSFER IMPEDANCE OF HONEYWELL 3892 CURRENT PROBE

✓ TRANSFER IMPEDANCE
-10 dB referenced to one ohm, or 0.316 ohms, see curve.

APERTURE SIZE
1.125 inches.

✓ MAXIMUM POWER LINE CURRENT
350 amperes, DC or AC rms

✓ PHASE LINEARITY
± 2° from 10 kHz to 5 MHz, see curve.

CONNECTOR
Type BNC, type N furnished on request, protective cap supplied.

✓ REFLECTED IMPEDANCE
Less than 0.0025 ohms, when terminated in 50 ohms, over the frequency range from 1 kHz - 5 MHz.

✓ FILTER SELECT
High pass filter contained in probe may be inserted in probe signal line with miniature toggle switch.

PACKAGING SPECIFICATIONS:

NET WEIGHT: 5 lbs., 2.5 kg. SHIPPING WEIGHT: 6 lbs., 3 kg.

ORDERING INFORMATION:

Specify Model 3892 Current Probe.....$290

For ordering purposes, list those specifications indicated with a check (✓) mark.

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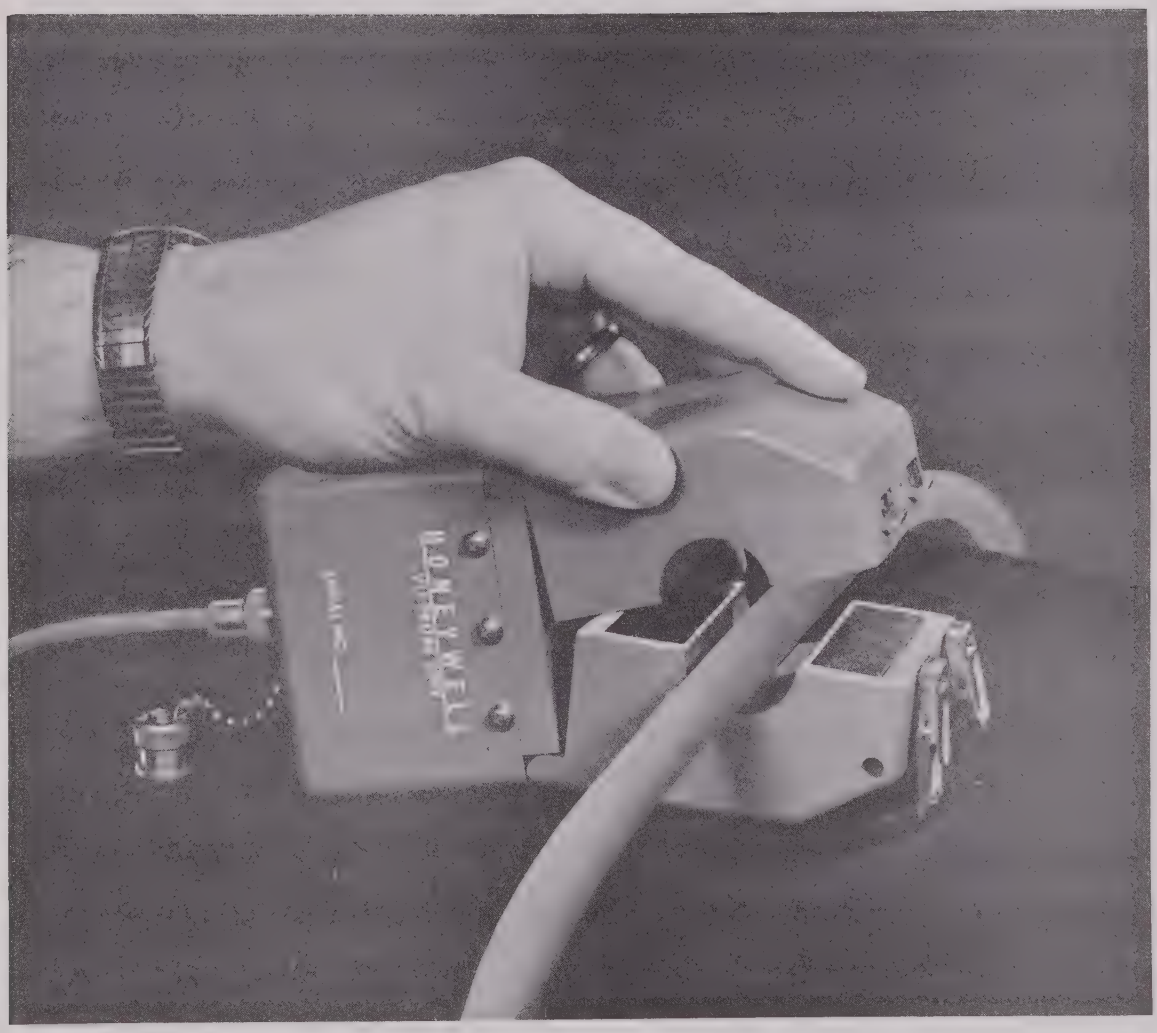

Current Probe
Model 3892

HONEYWELL
INC.

30" LOOP ANTENNA

SPECIFICATIONS

Size:	30" Diameter
Frequency Range:	20 Hz to 50 kHz
Connector:	Twinax Weatherproof
Mounting:	Threaded Hole for Tripod Mount. (Tripod not furnished.)
Correction Factor:	Curve (Antenna Factor in dB vs. Frequency in kHz) supplied with Antenna.
Cable:	20' of RG 108A/U with Twinax connectors supplied.

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HONEYWELL
INC.

PRELIMINARY SPECIFICATIONS

HF RECEIVER, MODEL 6868

SPECIFICATIONS:

Frequency Readout:	Five-digit Nixie readout plus sixth digit selector switch, 0-9.
Resolution	100 Hz
Accuracy	2 ppm
AFC	Internally derived from frequency counter.
Input Attenuation	50 dB in 10 dB increments.
Input Impedance	50 ohms single ended or 300 ohms balanced or single ended.
Outputs	IF, Video, Audio, Remote Frequency Readout (BCD).
Output Levels:	
IF	0 dBm into 50 ohms.
Video	5 V pk-pk AM into 50 ohms 10 V pk-pk FM into 50 ohms.
Audio	1 watt into 3-ohm speaker 2 volts into 600 ohms
Power	105-125 VAC, 48-480 Hz.
Price	$4,800.00.

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HONEYWELL
INC.

PRELIMINARY SPECIFICATIONS

HF RECEIVER, MODEL 6868

APPLICATION:

The Honeywell Model 6868 HF Receiver is a highly sensitive, superhetrodyne receiver designed for surveillance, manual and automated EMI /RFI testing, and spectrum analysis applications, as well as for general communications use in the frequency range of 500 kHz to 32 MHz.

FEATURES:

Seven selectable bandwidths.

Improved narrowband and broadband sensitivity.

Six basic detection modes.

Three output modes.

Voltage Controlled tuning
- Remote or Local
- Sweep or Manual

Digital Frequency Readout.

SPECIFICATIONS:

Frequency Coverage	0.5 to 32 MHz in eight bands, manual or automatic band changing.
Type of Reception	AM, FM, NFM, Impulse, USB, LSB, SSB, CW, FSK.
Bandwidths	100 kHz, 30 kHz, 10 kHz, 3 kHz, 800 Hz, 300 Kz, 100 Hz - selectable remotely or at the front panel.
Noise Figure	6 dB maximum.
Spurious Response Image and IF	80 dB below effective input noise.
Dynamic Range	70 dB measured at video output.

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	internal sweep; contact closure for I. F. bandwidth change. Three auxilliary BNC connectors.
Oscillator Radiation	Less than 5 μV at antenna terminal into 50-ohm load.
Oscillator Stability	±10 Hz when on digital automatic frequency control.
Broadcast Rejection	40 dB rejection above 540 kHz, negligible attenuation below 500 kHz.
Operating Temperature	0 to 55°C, 25 to 45°C @ 95% relative humidity.
Power	105 to 125 V, 59-61 Hz; 210 to 250 V, 49-51 Hz Power Line RFI filter.
Weight	Shipping: 43 lbs (19.6 kg.); Operating: 35 lbs. (15.9 kg.)
Size	17" W x 5-1/4" H x 19" D

VLF Receiver
Model 6869

HONEYWELL
INC.

MEASURE RF CURRENT WITHOUT LINE CONNECTION

CURRENT PROBE, MODEL 3893

OUTSTANDING FEATURES:

- Wide Frequency Range
- Constant Transfer Impedance
- High Power Line Current AC or DC
- Extremely Low Reflected Impedance
- Useful to Below 50 Hz

PRODUCT DESCRIPTION:

The clamp-on current probe permits direct measurement of current in a conductor without disturbing the measured circuit. The Honeywell 3893 Current Probe enables a receiver, oscilloscope, voltmeter, or other instrumentation to accurately and rapidly measure current. Measurement is made by clamping the probe around the conductor and observing the probe output voltage. Since the Model 3893 is completely shielded, accurate measurements can be made without measurable effects from stray fields. Position of the conductor within the probe aperture does not affect the probe accuracy.

Honeywell current probes maintain specified transfer impedance and frequency response unaffected by the AC or DC power current flowing in the conductor. This is particularly important when measuring harmonic currents or radio-frequency currents superimposed on primary power current. The Honeywell 3893 Current Probe can have over 300 amperes, either DC or AC power, flowing in the conductor without affecting the probe characteristics.

The 3893 probe is a split secondary, single turn primary, toroidal transformer with a known transfer impedance. Transfer impedance is defined as the output voltage divided by the input (primary) current. Knowing the probe transfer impedance, the current in the inserted probe primary can be calculated.

OPERATION:

The probe is clamped around the conductor carrying the current to be measured, the probe output BNC connected through a 50-ohm, terminated cable to the

detection instrument, and the probe output voltage observed. The probe voltage, divided by the transfer impedance equals the primary current, or the current to be measured. If measurements are in terms of dB above a reference level, then the transfer impedance of the probe in dB re one ohm is subtracted from the output voltage in dB to obtain current in dB.

APPLICATION:

Honeywell current probes have been developed as a necessary accessory for spectrum analysis of complex current waveforms and for automated EMI/RFI measurement. The 3893 Current Probe response rolls off at a -6 dB per octave rate below 500 kHz. The Honeywell Model 3893 Current Probe was designed for use with the Honeywell Model 6868 HF Receiver, the frequency ranges were designed to coincide, but the 3893 probe may be used in any current measuring or monitoring application.

Typical applications for the Model 3893 Current Probe are:

1. Replacement of line stabilization networks in RFI measurements.

2. Measure normal functioning of electrically power equipment.

3. Measurement of complex current waveforms in hazardous environments, no interruption of power required.

4. General monitoring device.

5. Pick-up device for oscilloscopes, data acquisition, signal conditioning, telemetry, light beam and magnetic recorders.

OPERATIONAL SPECIFICATIONS:

✔ FREQUENCY RANGE
500 kHz - 30 MHz ± 1 dB, useful from 50 Hz to above 50 MHz.

✔ TRANSFER IMPEDANCE
+10 dB referenced to one ohm, or 3.16 ohms, see curve.

✔ APERTURE SIZE
1.125 inches.

✔ MAXIMUM POWER LINE CURRENT
350 amperes, DC or AC rms

CONNECTOR
Type BNC, type N furnished on request, protective cap supplied.

✔ REFLECTED IMPEDANCE
Less than 0.25 ohms, when terminated in 50 ohms, over the frequency range from 500 kHz - 30 MHz.

PACKAGING SPECIFICATIONS:

NET WEIGHT: 2 lbs., 1 kg. SHIPPING WEIGHT: 4 lbs., 2 kg.

ORDERING INFORMATION:

Specify Model 3893 Current Probe.

For ordering purposes, list those specifications indicated with a check (✔) mark.

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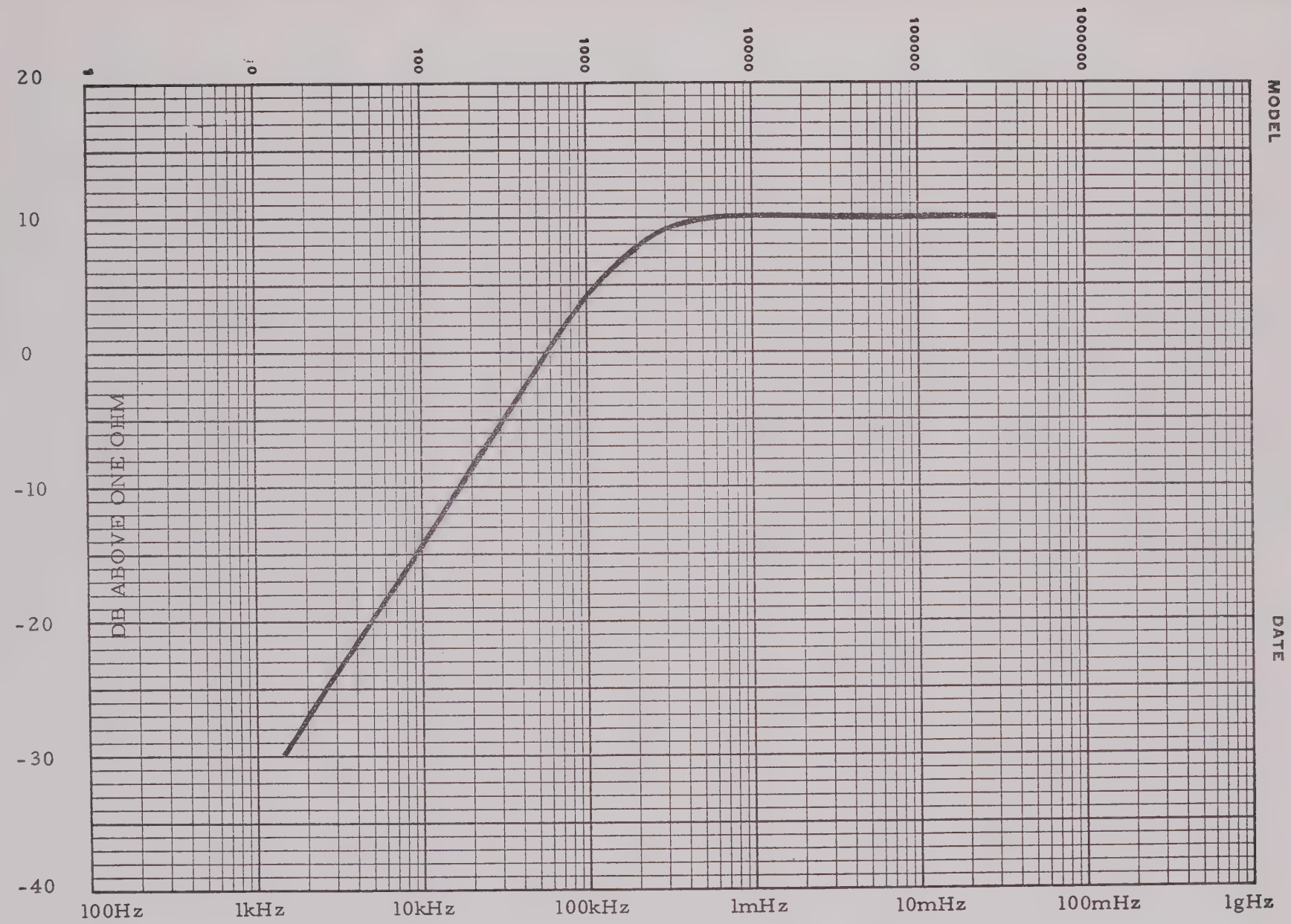

TRANSFER IMPEDANCE OF HONEYWELL 3893 CURRENT PROBE

HONEYWELL
INC.

LOW NOISE, SWEPT VHF CONVERTER

MODEL 6801

A low noise, swept or manually tuned, VHF Down Converter, to cover the frequency range from 30 - 300 MHz.

OUTSTANDING FEATURES:

- Low Noise Figure
- Swept or Manual Operation
- Variable Sweep Rate
- Two Band Coverage
- Output at 21.4 MHz
- Wide Bandwidth
- Frequency Analog Output
- Low Oscillator Radiation
- Power Line RFI Filter

The 6801 VHF Converter features low noise, high gain, manual or automatic sweep, variable sweep rate, and analog frequency output for extending the operating range of existing HF receiving systems at minimal cost. The output from the 6801 VHF Converter is centered at 21.4 MHz I.F., which is routed to an HF detection system tuned to 21.4 MHz. The normal operating mode of the HF receiver is not changed, the signal proceeding from 21.4 MHz input to demodulated output in standard fashion.

The high gain I.F. amplifier, detectors, BFO, audio amplifier, video amplifier, metering circuits, and other hardware are eliminated using the down converter approach. The 6801 VHF Converter selects the operating frequency and translates the signal down to 21.4 MHz for treatment by the HF receiver as a normal input signal.

SPECIFICATIONS:

Frequency Range:	30-300 MHz in two bands: Band A: 30-70 Band B: 60-300
Noise Figure:	6.5 dB, maximum
Nominal Gain:	30 dB, ± 3 dB
Input Impedance:	50 ohms nominal
Image Rejection:	55 dB, minimum

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I. F. Rejection:	Band A: 50 dB, minimum; Band B: 60 dB, minimum
I. F. Output:	21.4 MHz
Over-all Bandwidth:	Band A: 2 MHz; Band B: 4 MHz
Oscillator Radiation:	15 μV, maximum
Input Attenuator:	50 ohms, 0/10/20/30/40/50 dB steps
Tuning Dial Resetability:	±1%
Analog Tuning Output:	Band A: +5 - +15 V; Band B: +5 - +15 V
Gain Variation with Tuning:	6 dB, maximum
Over-all Bandpass Ripple:	3 dB, maximum
Power Consumption:	50 watts
Automatic Tuning Mode:	15 seconds to scan band
Input Power:	110/220 V AC, 50-60 Hz
Power Line RFI:	80 dB Filter @ 300 kHz
Size:	19"W x 7"H x 21"D
Weight:	25 lbs.

HONEYWELL
INC.

BROADBAND DIPOLE ANTENNA FROM 20-200 MHz FOR EMI/RFI MEASUREMENT AND COMMUNICATIONS APPLICATION

BI-CONICAL ANTENNA, MODEL 7825

OUTSTANDING FEATURES:

- ✔ Required and specified by MIL-STD-461.
- ✔ Constructed in accordance with Department of Defense drawings ES-F-201286.
- ✔ Designed to operate into 50-ohm load.
- ✔ No adjustment of length required, ideal for automated measurements.

May be polarized horizontally or vertically.

For use with all RF instruments having 50-ohm input.

PRODUCT DESCRIPTION:

The Honeywell Model 7825 Bi-Conical Antenna is designed for rapid measurement of received signal strength or field intensity. No dipole length adjustment is necessary over the frequency range from 20-200 MHz. The Model 7825 Bi-Conical Antenna is designed to the requirements of MIL-STD-461 and D.O.D. drawings ES-F-201286. The broadband characteristics permit wideband or automatic scanning operation without adjustment of the dipole length. The Honeywell 7825 dipole may be used for both manual and automatic measurement of signal strength and field intensity.

APPLICATIONS:

Measure electromagnetic radiation over frequency range from 20 to 200 MHz in accordance with MIL-STD-461 and MIL-STD-826A.

Radiation measurement in shielded enclosures.

Radiation measurement in far field.

May be used as transmitting antenna by connection to signal sources.

For use with any noise and field intensity instrument having a 50-ohm input.

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OPERATION:

The operation of the 7825 Bi-Conical Antenna is extremely simple. The dipole arms are fitted into the balun mounting arm, and the balun output BNC is connected to the RF detection instrument through a shielded, 50-ohm cable. The measurement is made by knowing the input signal voltage level to the RF detection system and adding the dipole correction factor.

OPERATIONAL SPECIFICATIONS:

✔	Frequency:	20-200 MHz
✔	Type:	Broadband, Bi-Conical, Dipole Antenna
✔	Impedance:	50-ohm unbalanced
✔	Antenna Correction Factor:	See curve below.
✔	Maximum Field Intensity:	10 volts/meter
✔	Maximum Input to BNC:	2 volts
	Connector:	Type BNC

PACKAGING SPECIFICATIONS:

Dimensions: 57" w x 32" l x 21" d

Weight:	Net:	6 lbs.	2.7 kg.
	Shipping:	10 lbs.	4.5 kg.

ORDERING INFORMATION:

Specify: Model 7825 Bi-Conical Antenna.....$ 295.00

For ordering purposes list those specifications indicated with check mark (✔).

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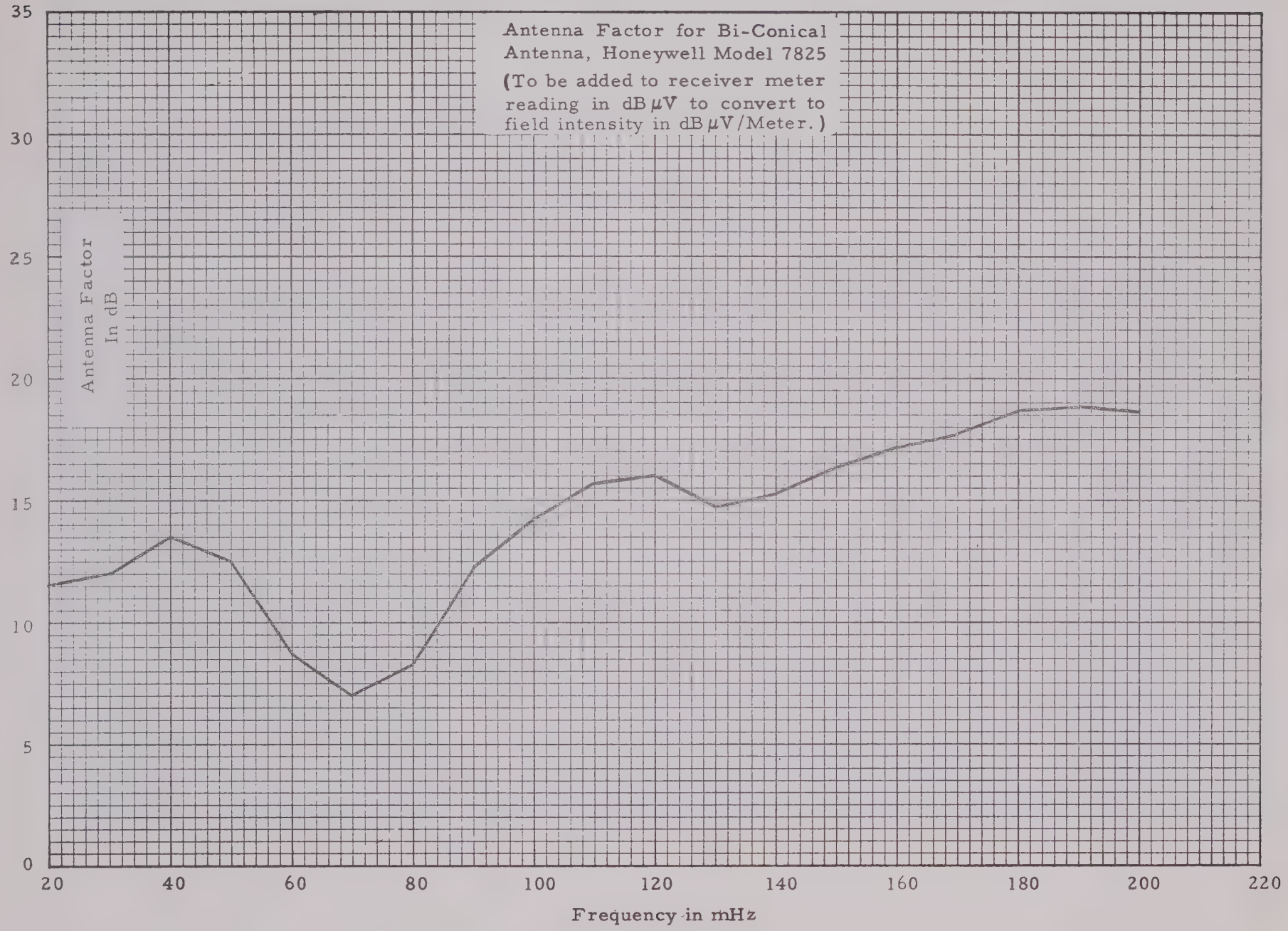
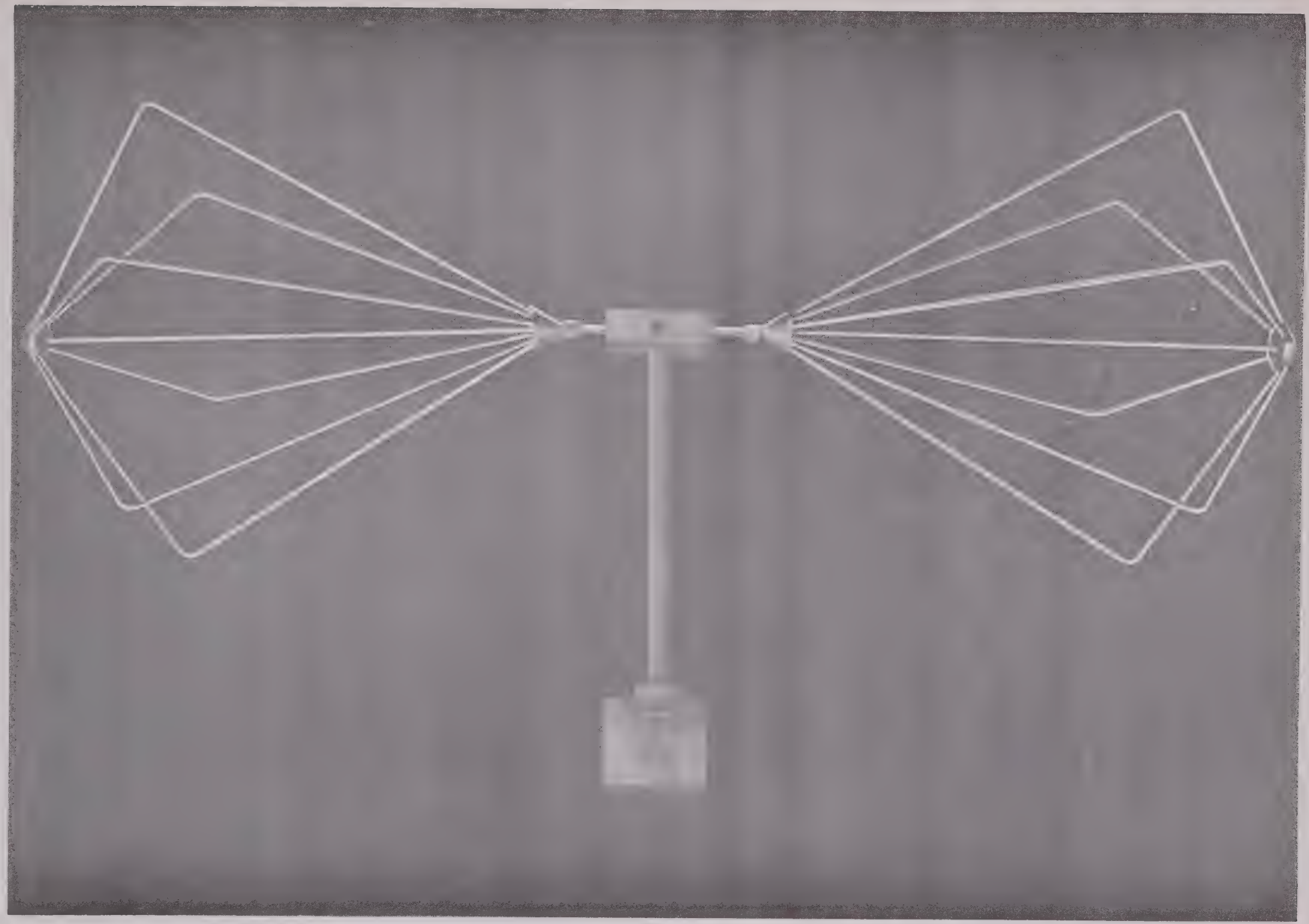
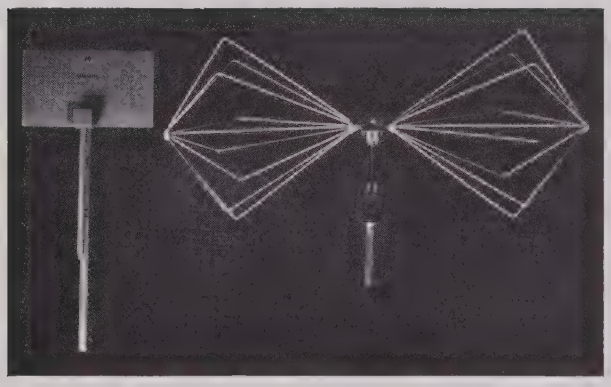

Antenna Factor for Bi-Conical Antenna, Honeywell Model 7825
(To be added to receiver meter reading in dBμV to convert to field intensity in dBμV/Meter.)
Antenna Factor In dB
35
30
25
20
15
10
5
0
20
40
60
80
100
120
140
160
180
200
220
Frequency in mHz



Bi-Conical Antenna
Model 7825

Honeywell

Wideband reception from
88 to 1000 MHz without tuning.



Antennas

Bi-conical **Model BCA-902**

Bi-triangle **Model BTA-901**

Outstanding Features:

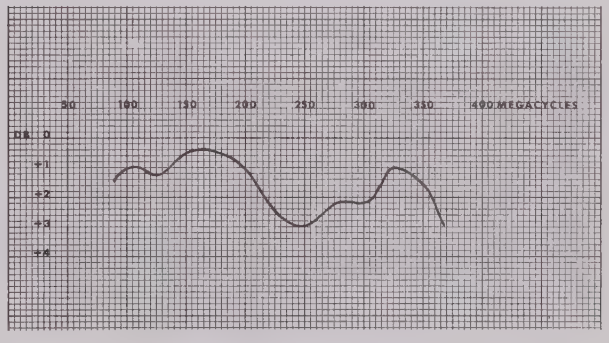
- ✔ Broad bandwidth
- ✔ 50 ohm unbalanced impedance
- Light weight, sturdy construction

Product Description:

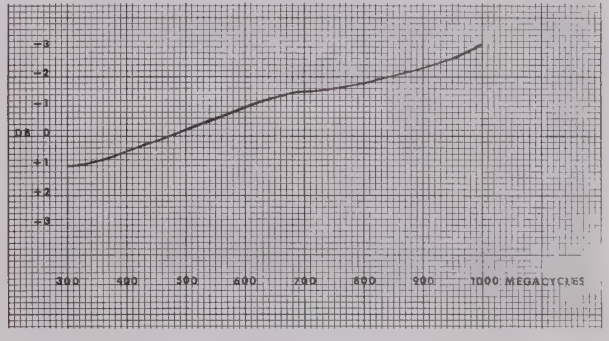
The Honeywell Model BCA-902 is a bi-conical, broadband dipole antenna with an operating range of 88 to 350 MHz. The Honeywell Model BTA-901 is a bi-triangle, broadband dipole antenna with an operating range of 300 to 1000 MHz. The antennas are fitted with broadband baluns which permit them to operate efficiently over their frequency range without tuning. The antennas and baluns are mounted on wooden masts to form sturdy, light weight units. The antenna masts are reduced at the base and have a pin inserted in the side to fit in standard (Stoddart or Empire) antenna mounting adapter, which in turn mounts on tripod. A threaded insert is set in the bottom of the mast to accept a ¼-20 screw for mounting directly on tripod.

Applications:

The Model BCA-902 and the Model BTA-901 Antennas are designed for use with receivers operating in the frequency ranges of 88 to 350 MHz and 300 to 1000 MHz respectively. Either antenna may be used for field intensity measurements within its frequency range. When using the antennas for field intensity measurements, a correction factor in addition to all of the standard correction factors that are ordinarily applied to the standard dipole, such as effective height, mismatch, etc., must be made in accordance with the correction factor graphs shown below.



BCA 902 Bi-conical correction factor.



BTA 901 Bi-triangle correction factor.

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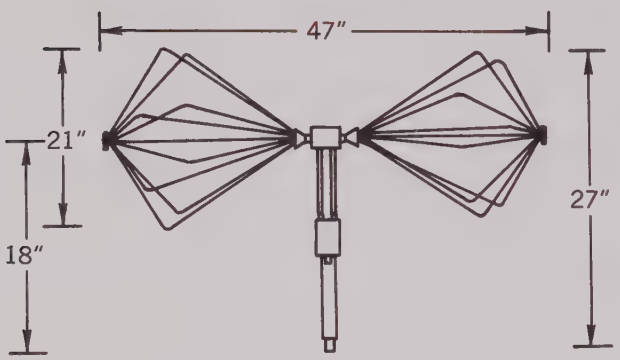
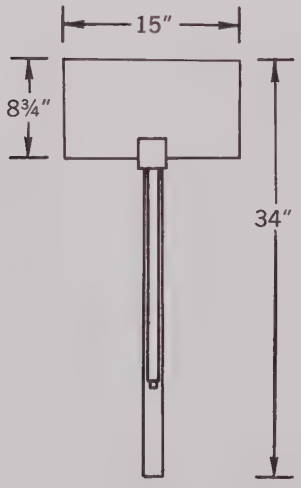
Operational Specifications:

- ✔ **Frequency Range:**
  - **Model BCA-902 Bi-conical:** 88 to 350 MHz
  - **Model BTA-901 Bi-triangle:** 300 to 1000 MHz
- ✔ **Impedance:** 50 ohm unbalanced
- **Connectors:** Type N
- **Mast:** 1 inch diameter varnished oak fits standard antenna mounting adapter — insert for ¼-20 tripod screw

Packaging Specifications:



MODEL BCA-902



MODEL BTA-901

Weight:	Model BCA-902	Model BTA-901
Net	5 lbs.	4 lbs.
Shipping	10 lbs.	7 lbs.

Ordering Information:

Specify:	**Price**
Model BCA-902 Bi-Conical Antenna	$ 260.00
Model BTA-901 Bi-Triangle Antenna	$ 190.00

For ordering purposes list those specifications indicated with a check (✔) mark.

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Honeywell

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HONEYWELL
INC.

MEASURE RF CURRENT WITHOUT LINE CONNECTION

CURRENT PROBE, MODEL 3896

OUTSTANDING FEATURES:

- Wide Frequency Range
- Constant Transfer Impedance
- High Power Line Current AC or DC
- Low Reflected Impedance
- Useful to Below 10 kHz

PRODUCT DESCRIPTION:

The clamp-on current probe permits direct measurement of current in a conductor without disturbing the measured circuit. The Honeywell 3896 Current Probe enables a receiver, oscilloscope, voltmeter, or other instrumentation to accurately and rpaidly measure current. Measurement is made by clamping the probe around the conductor and observing the probe output voltage. Since the Model 3896 is completely shielded, accurate measurements can be made without measurable effects from stray fields. Position of the conductor within the probe aperture does not affect the probe accuracy.

Honeywell current probes maintain specified transfer impedance and frequency response unaffected by the AC or DC power current flowing in the conductor. This is particularly important when measuring harmonic currents or radio-frequency currents superimposed on primary power current. The Honeywell 3896 Current Probe can have over 300 amperes, either DC or AC power, flowing in the conductor without affecting the probe characteristics.

The 3896 probe is a split secondary, single turn primary, toroidal transformer with a known transfer impedance. Transfer impedance is defined as the output voltage divided by the input (primary) current. Knowing the probe transfer impedance, the current in the inserted probe primary can be calculated.

OPERATION:

The probe is clamped around the conductor carrying the current to be measured, the probe output BNC connected through a 50-ohm, terminated cable to the detection instrument, and the probe output voltage observed. The probe voltage, divided by the transfer impedance equals the primary current, or the current

to be measured. If measurements are in terms of dB above a reference level, then the transfer impedance of the probe in dB re one ohm is subtracted from the output voltage in dB to obtain current in dB.

APPLICATION:

Honeywell current probes have been developed as a necessary accessory for spectrum analysis of complex current waveforms and for automated EMI/RFI measurement. The 3892 Current Probe response rolls off at a -6 dB per octave rate below 30 mHz. The Honeywell Model 3896 Current Probe was designed for use with the Honeywell Model 6801 Converter, the frequency ranges were designed to coincide, but the 3896 probe may be used in any current measuring or monitoring application.

Typical applications for the Model 3896 Current Probe are:

1. Replacement of line stabilization networks in RFI measurements.
2. Measure normal functioning of electrically powered equipment.
3. Measurement of complex current waveforms in hazardous environments, no interruption of power required.
4. General monitoring device.
5. Pick-up device for oscilloscopes, data acquisition, signal conditioning, telemetry, light beam and magnetic recorders.

OPERATIONAL SPECIFICATIONS:

✔ FREQUENCY RANGE
30-300 MHz ± 1 dB, useful from 10 kHz to above 500 MHz.

✔ TRANSFER IMPEDANCE
+10 dB referenced to one ohm, or 3.16 ohms, see curve.

✔ APERTURE SIZE
1.125 inches.

✔ MAXIMUM POWER LINE CURRENT
350 amperes, DC or AC rms

CONNECTOR
Type BNC, type N furnished on request, protective cap supplied.

✔ REFLECTED IMPEDANCE

Less than one ohm, when terminated in 50 ohms, over the frequency range from 30-300 MHz.

PACKAGING SPECIFICATIONS:

NET WEIGHT: 2 lbs., 1 kg. SHIPPING WEIGHT: 4 lbs., 2 kg.

ORDERING INFORMATION:

Specify Model 3896 Current Probe.

For ordering purposes, list those specifications indicated with a check (✔) mark.

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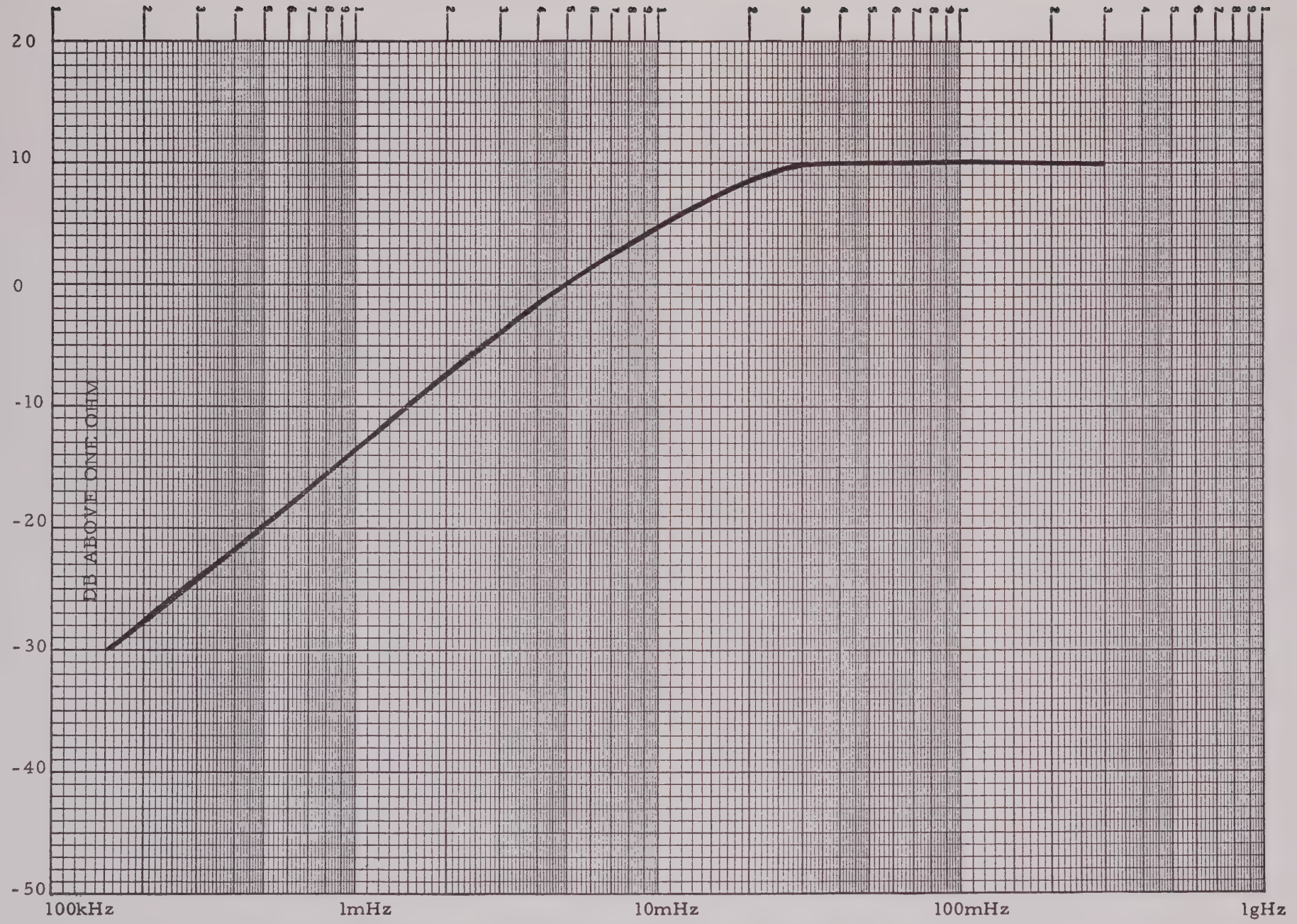

TRANSFER IMPEDANCE OF HONEYWELL 3896 CURRENT PROBE

HONEYWELL
INC.

LOW NOISE, SWEPT UHF CONVERTER

MODEL 6802

A low noise, swept or manually tuned, UHF Down Converter, covering the frequency range from 300 - 1000 MHz.

OUTSTANDING FEATURES:

- Low Noise Figure
- Swept or Manual Operation
- Variable Sweep Rate
- Single Band Coverage
- Output at 60 MHz
- Wide Bandwidth
- Frequency Analog Output
- Low Oscillator Radiation
- Power Line RFI Filter

The 6802 UHF Converter features low noise, high gain, manual or automatic sweep, variable sweep rate, and analog frequency output for extending the operating frequency range of existing receiving systems at minimal cost. The output from the 6802 UHF Converter is centered at 60 MHz I. F., which is routed to a VHF Receiver or second converter tuned to 60 MHz. The normal operating mode of the VHF receiving system is not changed, the signal proceeding from 60 MHz input to demodulated output in standard fashion.

Repetition of high gain I. F. amplifier, detectors, BFO, audio amplifier, video amplifier, metering circuits, and other hardware is eliminated using the down converter approach. The 6802 UHF Converter selects the operating frequency and translates the signal down to 60 MHz for treatment by a VHF detection system as a normal input signal.

SPECIFICATIONS:

Frequency Range:	One band, continuous coverage, 300-1000 MHz
Noise Figure:	8 dB @ 300 MHz; 10 dB @ 1000 MHz
Nominal Gain:	30 dB ± 3 dB
Input Impedance:	50 ohms nominal

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Image Rejection:	65 dB, minimum
I. F. Rejection:	75 dB, minimum
Output Frequency:	60 MHz
Output Bandwidth:	2 MHz @ -6 dB
Osc. to Ant. Conduction:	10 μV
Input Attenuator:	50 ohms, 0/10/20/30/40/50 dB steps
Frequency Display:	Mechanical Dial
Analog Voltage Output:	+5 V = 300 MHz; +15 V = 1000 MHz
Sweep Rate Control:	Front Panel Rate Adjust., Front Panel Sweep Direction Control
Power Input Consumption:	115/230 V AC, 50-60 Hz, 60 watts
Power Line RFI Filter:	Honeywell FPA-1003 80 dB Attenuation @ Rated Load from 0.3 - 1000 MHz
Ambient Temperature Range:	0°C to +55°C
Connectors:	Type BNC
Size:	17"W x 7"H x 21"D
Weight:	30 lbs.

HONEYWELL
INC.

SYSTEM LOG CONVERTER

SPECIFICATIONS

Dynamic Range:	100 dB
Input Signal Level:	300 μV - 30 V
Conversion Coefficient:	0.05 volt ± 1 millivolt/dB change in input.
Input Impedance:	100,000 ohms ± 1%
Output Impedance:	Less than 500 ohms. Output current less than 1 ma maximum.
Drift:	<20 microvolts referred to input after 10-minute oven warmup.
Offset:	Ten turn control calibrated in dB with linearity of ± 0.5% allows a correction factor of from + 100 dB to - 100 dB in 1.0 dB increments.
(+) or (-) Offset Switch:	Allows choice of offset polarity.
Preset:	One turn control allows output to be zeroed for any input from +100 microvolts to + 1 millivolt.
Power:	50 to 60 Hz, 115/230 volts ±10%, 7.3 volt-amperes.

Honeywell

TEST INSTRUMENTS DIVISION
4800 EAST DRY CREEK ROAD
DENVER, COLORADO 80217

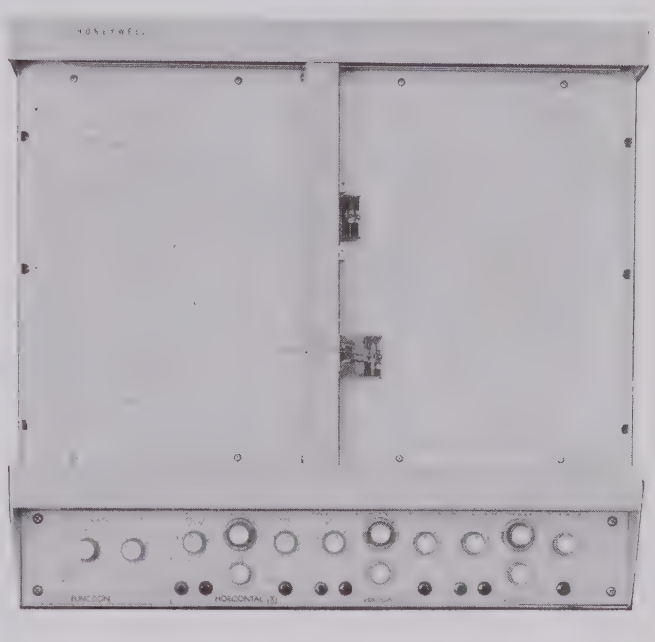
X-Y AND X-YY' RECORDERS

SERIES 500

General Description

Honeywell built their first X-Y recorder in 1955. During the past nine years, numerous significant state-of-the art advances have been incorporated into these instruments until today they represent the finest graphic recording instruments available.

The Series 500 X-Y and X-YY' Recorders comprise various models designed expressly to meet the needs of general purpose graphic recording for laboratory, industrial and business use. The 11 x 17 inch recording area provides greater definition when needed, yet 8½ x 11 inch paper can also be used if desired. The basic recorder is capable of either table or rack mounting and may be obtained as a self contained laboratory unit or for direct compatibility with computers. Series 500 X-Y and X-YY' Recorders are capable of graphing the relationship between either two or three independent quantities which have been converted to an equivalent, varying DC voltage. For those instances where this type of operation is not feasible, information may be taken in direct digital form through the use of converters or keyboards. In addition, all models may be operated with various accessories which expand the recording capabilities still further. Extreme care is taken in the design of the Series 500 Recorders such that damage from improper handling is virtually impossible. This feature coupled with simplified operating procedures enables non-technical personnel to produce excellent recordings with a minimum of training.



Outstanding Features

UNIVERSAL MOUNTING — permits either table or rack mounting with one instrument and without the need of modifications or adaptors.
FIXED INPUT IMPEDANCE — prevents source loading when the recorder is at other than a null condition.
MAINTENANCE FREE — vacuum system employs an impeller which need not be serviced or turned off under standby conditions.
TRANSISTORIZED CIRCUITRY — provides cooler operation coupled with higher reliability.
REAR INPUT TERMINALS — are provided to facilitate connections when the instrument is rack mounted.
PULLEY AND CABLE DRIVE — system incorporating sealed, multiturn, follow-up potentiometers greatly simplifies maintenance and mechanical construction.
FLOATING FOLLOW-UP SYSTEM — minimizes potentiometer null and end point wear.
FRICTION CLUTCH — prevents instrument damage during unintentional overdriving of either axis.
STANDBY OPERATION — deactivates servos and automatically drives the carriage to the right hand margin for ease of paper loading.

Operational Specifications

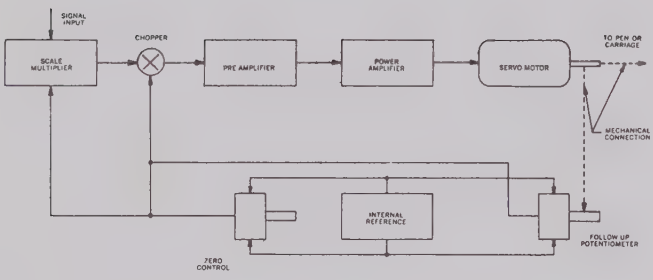
AXES: X and Y, independent and isolated from each other (Model 500, 500M, 510) X, Y and Y', independent and isolated from each other (Model 580)
ACCURACY: Static — ±0.15% at 25°C, ±.02% per °C (Model 500, 510), ±0.20% of F.S. (Model 500M, 580)
Dynamic — ±0.2% of F.S. for speeds less than 10 inches per sec. (All models)

SENSITIVITY: .0005 to 100 volts per inch in 20 steps with continuous vernier between steps (Model 500)
.0005 to 100 volts per inch in 16 steps with continuous vernier between steps (Model 580)
.0002 to 50 volts per centimeter in 20 steps with continuous vernier between steps (Model 500M)
0.1 to 10 volts per inch in 3 steps with continuous vernier between steps (Model 510)
TIME BASE RATES: .02 to 1.0 inches per second in 6 steps (Model 500, 580)
.04 to 2.0 centimeters per second in 6 steps (Model 500M)
TIME BASE ACCURACY: ±3% at .05 and .02 inches per sec., ±2% at all other rates (Model 500, 580)
±3% at .04 and .10 centimeters per second, ±2% at all other rates (Model 500M)
INPUT IMPEDANCE: 1 megohm on all scales (Model 500, 500M, 580)
2 megohms on all scales (Model 510)
MAXIMUM INPUT VOLTAGE: 500 volts DC (All Models)
FREQUENCY RESPONSES 3db down at 4 cps for 1 inch or 2.54 centimeters peak-to-peak dtflection (All models)
INPUT: single-ended floating, all inputs (All models)
ZERO CONTROL RANGE: full scale plus 90% offset on all inputs (All models)
INTERNAL REFERENCE: Zener regulated supply (All models)
EXTERNAL REFERENCE: computer +100 and —100 volt source (Model 510)
SPEED: 25 inches per second, X axis (Model 500, 510, 580)
62 centimeters per second, X axis (Model 500M)
20 inches per second, Y and Y' axis (Model 500, 510, 580)
50 centimeters per second, Y axis (Model 500M)
PAPER SIZE: 11 x 17 inches or 8½ x 11 inches (Model 500, 510, 580)
27.94 x 43.18 centimeters or 21.59 x 27.94 centimeters (Model 500M)
OPERATING TEMPERATURE: 0°C to 50°C (All models)
AC POWER INPUT: 230 or 115 volts, 50 to 60 cps, all models (specify desired voltage when ordering)

X-Y/X-YY' RECORDERS

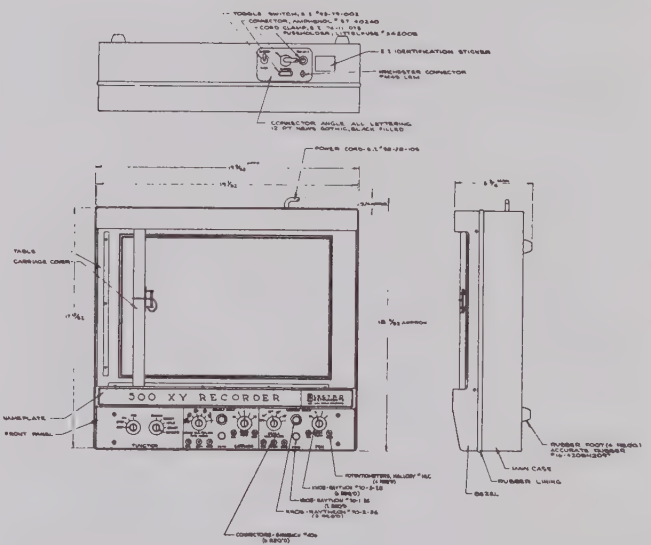
SERIES 500

Operation



The signal input voltage is first applied to an attenuation network and then to a voltage comparator. The feedback voltage is derived from a follow-up potentiometer which is mechanically coupled to the servo-motor which drives the axis in question. The magnitude of the feedback voltage is proportional to the relative position of the carriage (X axis), pen #1 (Y axis) or pen #2 (Y' axis) with respect to the magnitude of the input voltage on that axis. The voltage comparator compares the two voltages and develops a resultant 60 cps error voltage having a magnitude and phase which is proportional to the relative amplitudes and polarities of the applied voltages. The 60 cps error voltage is then amplified and applied to the control winding of the servo-motor. The motor thus rotates the follow-up potentiometer in the direction necessary to reduce the error voltage. Thereafter, any change in the input signal will cause the pen(s) and/or carriage to move to a position corresponding to the magnitude of the change. If a varying signal is applied, the pen(s) and/or carriage will follow those variations. In order to obtain high accuracy and good noise rejection, high gain, narrow bandwidth amplifiers are used in the servo loops. Servo loop equalization is also provided in order to gain stable operation with a good dynamic range.

Physical Parameters



MODEL 500

NET WEIGHT: 33 lbs. (Model 500, 500M, 510)
38 lbs. (Model 580)

SHIPPING WEIGHT: 40 lbs. (Model 500, 500M, 510)
45 lbs. (Model 580)

Ordering Information

OPERATIONAL SPECIFICATIONS — as listed above

FEATURE SPECIFICATIONS —

1) Rack or table mounting
2) Fixed input impedance
3) Transistorized circuitry
4) Front and rear input terminals
5) Pulley and cable drive
6) Impeller vacuum system
7) Floating follow-up system
8) Friction clutch
9) Standby operation
10) Visible ink reservoir

MODEL NUMBERS —

500 X-Y Recorder (English unit markings)	$1950.
500M X-Y Recorder (Metric unit markings)	1950.
510 X-Y Recorder (English unit markings, computer reference)	1950.
580 X-YY' Recorder (English unit markings)	3350.
580M X-YY' Recorder (Metric unit markings)	3350.00.

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HONEYWELL IS WORLDWIDE • Sales and service offices in all principal cities of the world. Manufacturing in Brazil, Canada, France, Germany, Japan, Mexico, Netherlands, United Kingdom, United States.

HONEYWELL
INC.

SPECTRUM GENERATOR

MODEL 4894

Crystal controlled multiple frequency testing and calibration of receivers, spectrum analyzers, filter networks, and data transmission systems

OUTSTANDING FEATURES:

- Frequencies crystal controlled.
- Wide range of spectral line spacings.
- Output amplitudes accurately controlled.
- Accurate 50-ohm output impedance.
- Combines crystal frequency accuracy with precise amplitude calibration of standard CW signal generators.
- Network responses can be measured without sweep techniques and associated transient problems.
- Precision 50-ohm output attenuator.
- Oven stabilized crystal frequency source.
- All silicon solid-state design.
- Double shielded for low r-f leakage.
- Power line RFI filter.

PRODUCT DESCRIPTION:

The Honeywell Spectrum Generator Model 4894 is designed for applications in design, testing, repair and calibration of receivers, spectrum analyzers, filters, and complex networks without manual tuning or swept frequency techniques. The output from the Model 4894 is a frequency comb, or line spectrum, with harmonics spaced at precise frequency intervals determined by the oven stabilized internal crystal standard and the associated digital circuitry. Frequency spacing can be selected as 50 Hz, 100 Hz, 500 Hz, 1 kHz, 5 kHz, 10 kHz, 100 kHz, 500 kHz, or 1 MHz. Amplitude of the spectrum may be varied in 10 dB steps, with each spectral line varying in amplitude by no more than ± 2 dB. The amplitude of all spectral lines, at any spacing and attenuation, is constant to 30 MHz.

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HONEYWELL
INC.

SPECTRUM GENERATOR, MODEL 4894

The Spectrum Generator Model 4894 combines the frequency precision of a crystal marker generator with the amplitude accuracy of a standard CW generator. Frequency calibration, sensitivity, frequency response, gain, and many other uses can be obtained without manual tuning or swept frequency techniques. The Model 4894 uses a double shielded enclosure and a precision 50-ohm attenuator to insure low r-f leakage and accurate measurement. Additional design precautions include a high attenuation power line RFI filter and a well regulated dc power supply.

APPLICATIONS:

- Measure gain, sensitivity, and frequency resolution and calibration of VLF/LF/MF/HF receivers, spectrum analyzers, filter networks, and complete r-f receiving systems.

- Measure filter passband insertion loss, cutoff frequency, rate of descent into stopband, and stopband insertion loss versus frequency without tedious manual methods or swept frequency techniques with their attendant transient response difficulties.

- Frequency and amplitude standard for automated r-f spectrum recording and analysis systems such as are used for RFI/EMI, ECM, and network response problems.

- Provides time and cost reduction in production measurement and testing, eliminating standard CW generators and point-by-point data.

- Standard signal generator for checking frequency response of linear amplifiers, and logging accuracy of logarithmic amplifiers.

- Marker generator for existing panoramic receivers, spectrum analyzers, and other swept frequency systems.

- Measurement involving response as a function of frequency, which formerly consumed hours or days, can be performed in minutes with greater accuracy using the Model 4894 Spectrum Generator rather than tunable CW signal generators.

OPERATION:

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HONEYWELL
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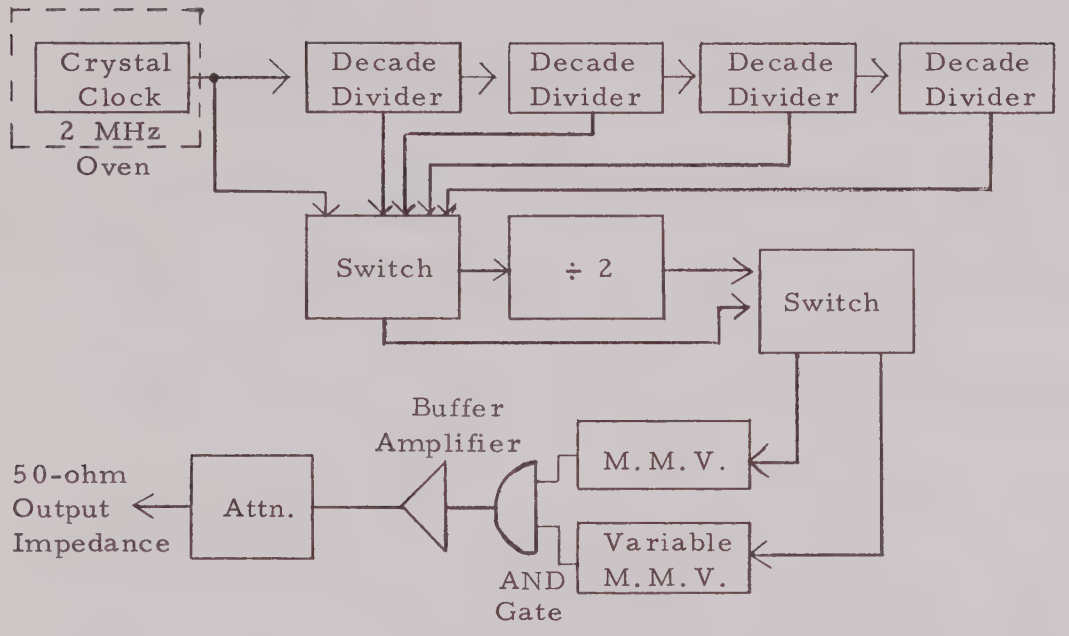
SPECTRUM GENERATOR, MODEL 4894



The oven stabilized 2 MHz crystal clock is divided down in frequency by the decade dividers; the output from each divider is routed to a switch for selecting frequency spacing. The switch output triggers two monostable multivibrators with different periods; the output pulse from the AND gate is routed to a buffer amplifier with a 50-ohm output impedance, through the output attenuator, and then to the shielded output connector. All internal signal connectors are made through shielded cable.

The frequency domain signals are a Fourier transform of the time domain pulse from the Spectrum Generator. The Fourier transform of the output pulse is a harmonic series with an envelope "scale factor" which is essentially constant, for the pulse chosen, to beyond 30 MHz. The harmonic spacing is determined by the pulse repetition rate, and the harmonic amplitude by the pulse height.

OPERATIONAL SPECIFICATIONS:

√ Spectral Line Spacing

50 Hz, 100 Hz, 500 Hz, 1 kHz, 5 kHz, 10 kHz, 50 kHz, 100 kHz, 500 kHz and 1 MHz.

√ Harmonic Amplitude

60/50/40/30/20/10 dB above 1 μv.
Additional unattenuated high level output.

HONEYWELL
INC.

SPECTRUM GENERATOR, MODEL 4894

√ Internal Oscillator

2 MHz crystal with stability of 0.5 ppm after 10-minute warm-up, from 0° C to + 55° C ambient.

√ Oscillator Monitor

High level 2 MHz clock signal for external counting or sync.

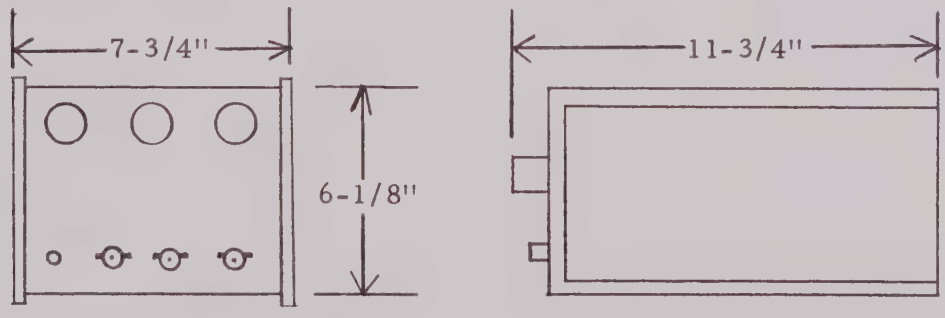
√ Leakage

10 dB below 1 μv/meter @ 3 ft. distance. Power line RFI filter.

√ Input Power

110/220 volts ac @ 50/60 Hz. Power line voltage changed with indicating switch on rear panel.

PACKAGING SPECIFICATIONS:



Net Weight: 6 pounds. Shipping Weight: 7 pounds.

ORDERING INFORMATION:

Specify:

Model 4894 Spectrum Generator

For ordering purposes list those specifications indicated with check mark (√).

The Model 4894 gives you maximum value at minimum cost. Contact your nearest Honeywell sales engineer today for a demonstration. Your purchase from Honeywell includes an interest that extends beyond the sale. Nationwide metrology service provides repair and calibration service for all Honeywell instrumentation.

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HEWLETT hp PACKARD

FREQUENCY COMB GENERATOR

model 8406A

TECHNICAL DATA 15 NOV 65

Frequency Marker Generator for Accurate Spectrum Analyzer, Wavemeter Calibration

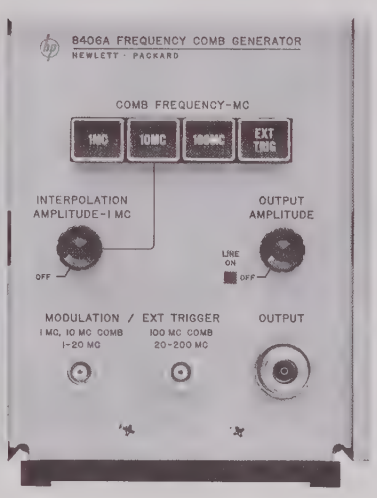
Description

The Hewlett-Packard Model 8406A Frequency Comb Generator provides a simple and convenient means of obtaining highly accurate, absolute frequency calibration of signals displayed on spectrum analyzers such as the HP 851/8551. The instrument is also useful for checking calibration and linearity of the spectrum analyzer's spectrum width function. Utilizing three crystal-controlled oscillators and a step-recovery-diode harmonic generator, the 8406A produces frequency markers with 1, 10, and 100 Mc spacing. The marker combs are usable from the fundamental marker frequency to beyond 5 Gc and have an accuracy of 0.01%. Figure 1 illustrates a 1 Gc-portion of the 100-Mc comb.

For interpolation convenience a primary-secondary comb—a combination of the 10- and 1-Mc combs—also can be generated as shown in Figure 2. The frequency of signals falling anywhere between the markers can be determined easily and accurately through use of an external oscillator. The external signal phase modulates the comb to produce sidebands displaced from the comb marker by the frequency of the modulation signal.

In another mode of operation external signals can be used to generate combs with fundamental frequencies anywhere between 1 and 200 Mc (marker spacings are equal to the external signal frequency). With appropriate adjustment of the spectrum width vernier control on the analyzer, these combs can be used to calibrate the spectrum width in arbitrary units such as bandwidths, harmonics, etc., to minimize calculations required of nontechnical personnel making routine measurements.

The presence of accurate frequency combs over such a wide frequency range (beyond 5 Gc) also makes the 8406A a convenient marker generator for use in rapid calibration of wavemeters.



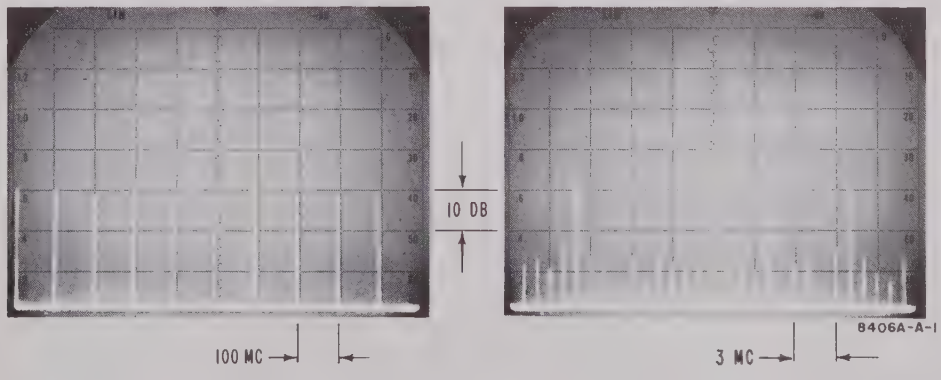


Figure 1. A portion of the 8406A 100-Mc comb, displayed on the HP 851B/8551B Spectrum Analyzer.

Figure 2. Spectrogram showing primary-secondary comb produced by combining 10- and 1-Mc combs.

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ted in U.S.A.

Specifications

Comb Fundamental Frequencies: 1, 10, and 100 Mc, push-button selected, generate harmonically related signals usable to beyond 5 Gc.

Comb Frequency Accuracy: ± 0.01% (0° to 50°C).

Peak Amplitude (in terms of equivalent cw signal level as measured on HP 851/8551 Spectrum Analyzer):

Comb	10 - 500 Mc	0.1 - 1 Gc	0.5 - 2 Gc	1 - 2 Gc	2 - 4 Gc
1 Mc	> — 80 dbm		> — 70 dbm		> — 82 dbm
10 Mc	> — 60 dbm		> — 50 dbm		> — 62 dbm
100 Mc		> — 45 dbm		> — 35 dbm	> — 47 dbm

OUTPUT AMPLITUDE control permits continuous level adjustment.

Comb Output Connector: Type N female, source impedance approximately 50 ohms.

Maximum External Signal at Comb Output: Signals exceeding 1 watt (peak and average) at the comb output may cause damage.

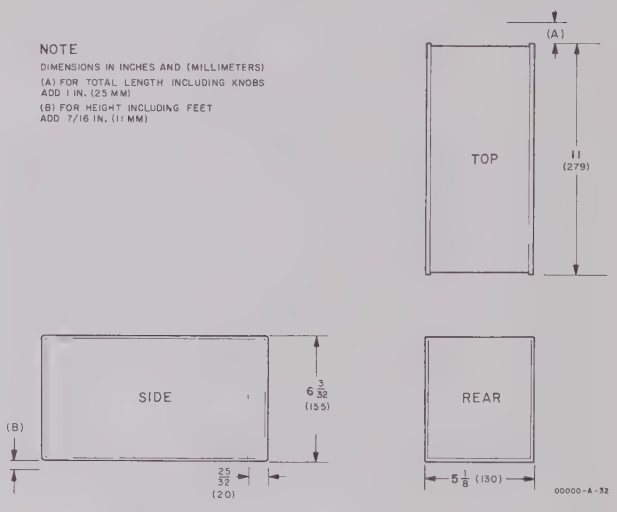
Interpolation Function: 10 Mc and 1 Mc combs can be combined into primary-secondary comb; INTERPOLATION AMPLITUDE control adjusts level of secondary (1 Mc) signal.

External Modulation: External modulation signals can be used to phase modulate any of the combs to produce sidebands for interpolation between fixed comb markers.* BNC female connector.

External Trigger: External signals (normally sine waves) between 1 and 200 Mc can be used to produce combs spaced at frequency of trigger signals.† BNC female connector.

Power: 115 or 230 volts ± 10%, 50 to 400 cps, 2 watts.

Dimensions:



Weight: Net, 6 lbs. *(2,7 kg)*. Shipping, 9 lbs. *(4,1 kg)*.

Price: Model 8406A, $500.00.

** External Modulation: Modulation frequencies can be as low as 5 Kc. Although the level of modulation voltage required varies with modulating frequency and the harmonic number of the comb being modulated, the information here will serve as a guide.*

To produce sidebands approximately 20 db below the main comb marker at the 1 Gc harmonic of the appropriate comb (comb output amplitude at maximum), typical modulation voltages are:

1-2 mv rms at 200 Kc for the 1 Mc comb.
5-10 mv rms at 2 Mc for the 10 Mc comb.
50-100 mv rms at 20 Mc for the 100 Mc comb.

Signals greater than 5 v rms at modulation input may cause damage.

† External Trigger: Typical input signal levels to generate externally triggered combs at the frequency of the external trigger are in the range of 1-3 volts rms. Input signals greater than 5 volts rms may cause damage. With input triggers in the 1-20 Mc frequency span, the OUTPUT AMPLITUDE control of the 8406A can be used to adjust the output comb level. When using signals in the frequency span from 20 to 200 Mc, output comb amplitude is a function of the input signal level.

Prices f.o.b. factory
Data subject to change without notice

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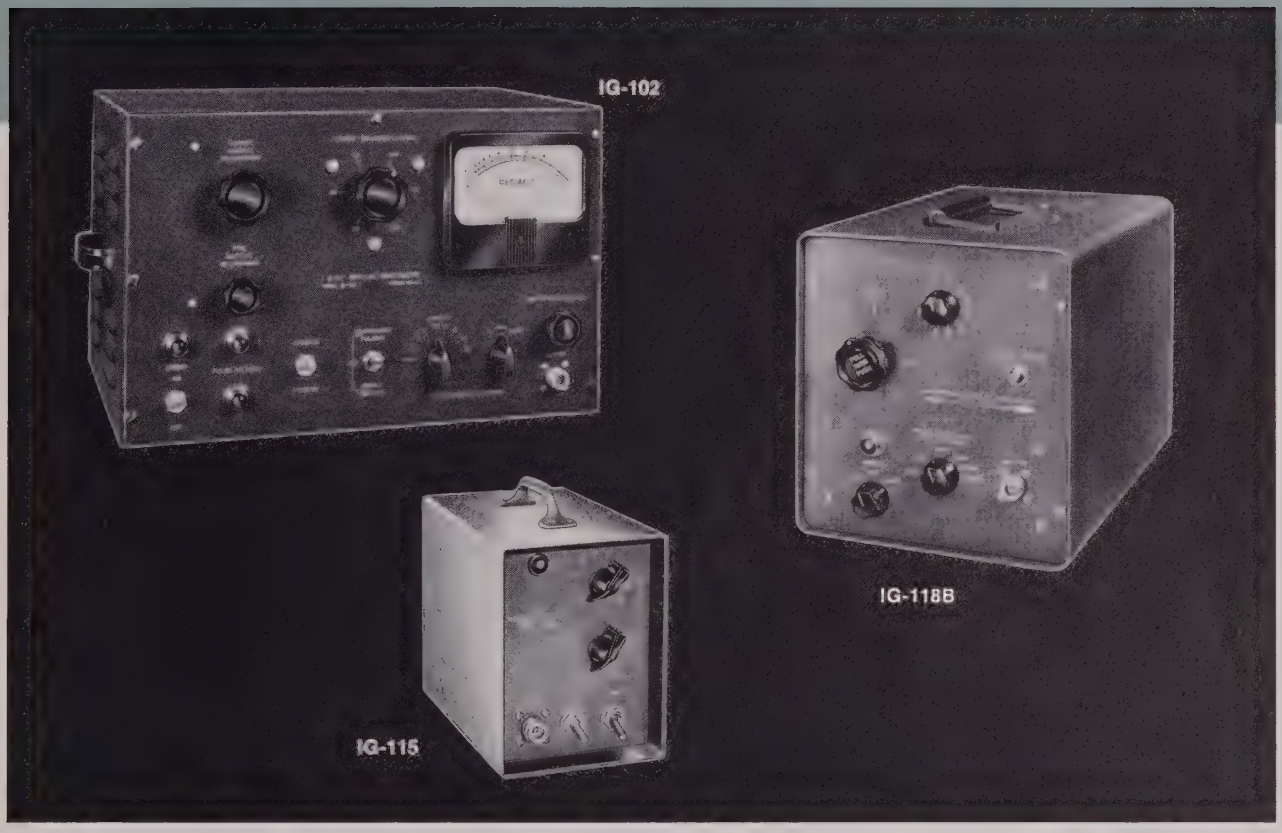
MICROWAVE IMPULSE GENERATORS



APPLICATIONS

- Calibrating standard for noise and field intensity meter
- Noise susceptibility of receivers
- Bandwidth determination
- Receiver alignment
- Transient response study
- Signal source for broad band amplifiers
- Signal source for evaluation of spectrum analyzers
- Noise figure measurement

FEATURES

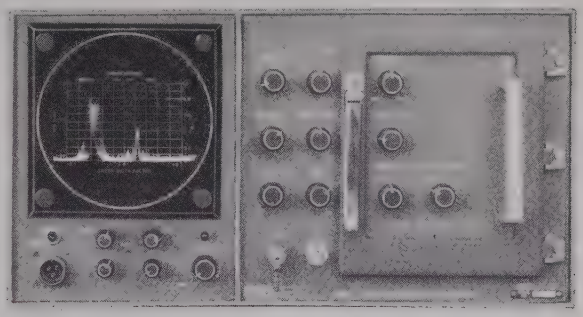
- Stable and reliable broadband source.
- Peak output directly calibrated in terms of DB above 1 microvolt per MHz of bandwidth.
- Known output level of broadband pulse energy with excellent long time stability is achieved by the simplicity of the basic design and technically sound execution. Originally designed for military application, the instruments are of sturdy mechanical construction, permitting field as well as laboratory use.

DESCRIPTION

These Impulse Generators are capable of producing pulses of extremely short duration — pulses in the fractional nanoseconds region. These pulses are primarily intended to produce an extremely broad RF spectrum. The spectrum achieved in Models IG-102 and IG-115 is flat to 1 GHz. The spectrum of Models IG-118A and IG-118B is flat from 1 to 10 GHz. Models IG-102, IG-118A and IG-118B feature variable repetition rates while Model IG-115 has a repetition rate corresponding to the power line frequency (50 to 60 Hertz). The pulses are obtained by discharging a coaxial line through a pair of discharge contacts into a load impedance, with the length of the charged line determining the duration of the pulse. Output level is referred to the rms value of a sine wave, and is calibrated in terms of microvolts per MHz of bandwidth. On Models IG-102, IG-118A and IG-118B, the pulse polarity reverses automatically. Model IG-115 has a panel switch which permits manual reversal of pulse polarity.

*A Trademark of THE SINGER COMPANY

EMPIRE Model NF-105
Noise and Field Intensity Meter
(14 kc to 1000 mc)



EMPIRE Model PA-210
Spectrum Signature Panadaptor

Ambient Electromagnetic Environment: Ambient Electromagnetic Environment is that electromagnetic level existing in any area and emanating from sources other than the test specimen.

Antenna Conducted Interference: Antenna Conducted Interference is any signal generated within a receiver or transmitter and appearing at the antenna terminals as an undesired signal. Examples are the second harmonic of a transmitter signal or the local oscillator signal of a receiver.

Antenna Counterpoise: Antenna Counterpoise, when used, provides a ground reference plane for the antenna.

Antenna Factor: A noise meter as a two-terminal device is calibrated in dbue (db above one microvolt across the input terminals) or dbmc (db above one microvolt per megacycle across the input terminals). When used with a calibrated antenna, the Antenna Factor in db is added to the two-terminal reading to provide either: (a) The induced antenna open-circuit voltage expressed as dbue or dbmc; or (b) The electric field strength in microvolts per meter (dbue/m) or microvolts per megacycle per meter (dbmc/m).

Antenna Induced Microvolts: Antenna Induced Microvolts is that voltage which is calculated to exist across the open-circuited antenna terminals.

Atmospheric Conditions: Unless otherwise specified in individual specifications, measurements and tests are usually made at room ambient temperature, atmospheric pressure and relative humidity.

Attenuation: Attenuation is a reduction in energy. Attenuation occurs naturally during wave travel through transmission lines, waveguides, space or a medium such as water or may be produced intentionally by inserting an attenuator in a circuit or an absorbing device in the path of the radiation. The amount of the attenuation is expressed in decibels or decibels per unit length.

Attenuator: An arrangement of fixed and/or variable resistive elements used to attenuate a signal by a desired amount.

Automatic Scanning: Automatic Scanning as referred to here, implies an automatic, variable speed scanning of the NFI meter, permitting a single sweep of the entire frequency range. Also, a Sector Scan Mode is included which allows the sweeping of a portion of the frequency range over a predetermined sector.

Bonding: Those practices used to connect electrically all ground wires, cable sheaths, etc. to ensure they are as close to being at the same potential as possible.

Broadband Interference: Broadband Interference is defined as an interference signal with a bandwidth much wider than the bandwidth of the measurement equipment in use. (Note: discussion of Broadband Interference is really based on an impulsive signal).

Conducted Interference: Conducted Interference is the interference being conducted from one point to another by way of power cords, signal lines, etc. It is measured in terms of voltage between two conductors or one conductor and ground. It is also measured in terms of the interference current flowing in a conductor.

Cross Coupling: Cross Coupling is the coupling of the signal from one channel to another where it becomes an undesired signal.

Cross Modulation: The type of interference in which the modulation or the interference signal is impressed upon the desired signal.

DB above 1.0 microvolt per megacycle: The unit of measurement of broadband impulsive electromagnetic interference is in terms of microvolts per megacycle. This term is equal to the number of root-mean-square sine wave microvolts applied to the input of the measuring circuit at its center frequency that will result in a detector peak response in the circuit equal to that resulting from the interference pulse being measured, divided by the impulse bandwidth of the circuit in megacycles. DBMC is a decibel form of the unit, i.e. db above one microvolt per megacycle. Applied to an impulse generator, it specifies the R.M.S. voltage at the peak of the wave, per megacycle of bandwidth.

Degradation: Degradation is an undesired change in the operational performance of a test specimen. Degradation of the operation of a test specimen does not necessarily mean malfunction.

Desensitization: Desensitization is the reduction in sensitivity of a receiver due to the presence of an undesired signal.

Filter: A circuit element used to restrict the range of frequencies transmitted through the element.

Forty-one inch Rod Antenna: A Forty-one inch Rod Antenna, (1 meter equivalent) is a standard length antenna used for field strength measurements. This antenna is loaded and matched to the associated receiving or transmitting equipment. Empire Model VA-105 is a typical example.

Fraunhofer: The Fraunhofer region is usually termed the far-field region in antenna terminology.

DEMONSTRATION AND ACCEPTANCE TESTING

Quality Control

The Annapolis Operation of Honeywell has an established Quality Assurance Department performing in accordance with the requirements of MIL-Q-9858A. The instrumentation offered under this proposal is standard, commercial electronic test equipment, built and tested in accordance with MIL-Q-9858A.

Demonstration

This system will be available at Annapolis, Maryland, prior to shipping, for operational demonstration. Honeywell will also provide personnel at the buyer's plant to demonstrate operation of the equipment.

Acceptance Testing

It is proposed that acceptance of the Model 7899 Automated EMI Measurement System will be based upon satisfactory performance tests conducted by Honeywell personnel at the buyer's plant. The criteria for these tests will be the specifications furnished herein.

MISCELLANEOUS

Manuals

Five (5) copies each of an Operating/Maintenance Manual will be

furnished as a part of the Model 7899 System.

Option

The Model 7899 Automated EMI Measurement System can also fulfill a panadapter/spectrum analyzer function. This is accomplished through the use of a CEI Model SM-8512 Spectrum Display Unit. The SM-8512 operates from a 455 kHz I.F., with characteristics compatible with the receivers used in the Honeywell 7899 System. Complete specifications for the spectrum display unit follow on the next page.

Technical Data

DATA SHEET 343.50 1/11/66

TYPE SM-8512 SIGNAL MONITOR

The CEI Type SM-8512 Signal Monitor has been designed for use with receivers having a 455-kc IF center frequency. It provides a visual display of signals in a band around the received frequency.

Base line break-up due to overload on strong signals has been eliminated in the SM-8512 by direct coupling of the detector to the CRT deflecting plates. This makes it possible to observe weak signals close to very strong signals.

Nuvistors and solid state devices are used in the design to keep power consumption and size to a minimum.

TYPE SM-8513 AVAILABLE

The Type SM-8513 Signal Monitor is a dual unit. Performance of each single unit is identical to the performance of an SM-8512 Signal Monitor. Each unit of the SM-8513 is completely independent of the other unit, from the front-panel controls to the separate rear-apron power cords. This equipment was designed for monitoring two signals simultaneously from different sources. The panel height of the SM-8513 is 5.25 inches.

Price: $2,900.00

COMMUNICATION ELECTRONICS INCORPORATED

6006 Executive Boulevard, Rockville, Maryland 20852 • Phone (301) 933-2800

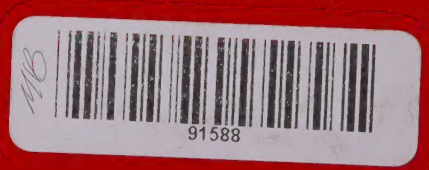
SPECIFICATIONS

Number of Inputs	One, type BNC
Input Impedance	50 ohms
Input Center Frequency	455 kc
Flatness of Response	Determined by RF response of receiver being employed; particulars available on request.
Sweepwidth	50 kc, 20 kc, or 5 kc, switched by front-panel control
Sweep Linearity	Linear over-all to within 5% of the total sweep width
Sweep Rate	
50-kc Sweep Width	12 cps ±2.5 cps
20-kc Sweep Width	8 cps ±2.0 cps
5-kc Sweep Width	4 cps ±1.0 cps
Resolution	
50-kc Sweep Width	Minimum 6-db valley between signals 2.5-kc apart
20-kc Sweep Width	Minimum 6-db valley between signals 1.2-kc apart
5-kc Sweep Width	Minimum 6-db valley between signals 250-cps apart
Image Rejection	50 db, minimum
Sensitivity	5 μv input at 455 kc produces at least one inch deflection on the CRT
Gain Control Range	60 db, minimum
Crystal Marker	
Frequency	455 kc
Tolerance	±0.01%
Amplitude Scales	
Linear	A signal 20 db down from the value that produces 100% vertical deflection will produce 10% deflection
Logarithmic	A signal 40 db down from the value that produces 100% deflection will produce 10% deflection
CRT Display Type	3XP2
Front Panel Controls	Center Frequency; Sweep Width; Gain; Marker, On/Off; Vertical Display, Lin/Log; Power; Intensity; Focus
Power Input	115/230 volts, 50-400 cps
Power Consumption	30 watts, approximately
Weight	15 lbs., approximately
Size	3.5-inches high, 19-inches wide, 15-inches deep

NOTE: A modification kit and instructions to modify the R390 and R390A receivers are included with the SM-8512. Please specify receiver type when ordering.

PRICE: $1,400.00

FOB Rockville, Maryland. Taxes extra where applicable. Price and specifications subject to change without notice.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